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The Ore Deposits of Santa Eulalia, Mexico

The Occurrence in Mantas and Abras and the Prevalence of Large Open Caves above Many of the Orebodies Is Characteristic

BY CLAUDE T. RICE

Santa Eulalia is one of the largest lead-silver producing camps in Mexico, and probably is the largest producer of oxidized lead ore in the world. For years it has furnished much of the fluxing ore used in smelting Mexican ores, and even before the time of the railroad, ore from Santa Eulalia was packed on mules as far south as Durango to be used in smelting the gold and silver ores of that State. Now the ore is sent to El Paso, Torreon, Aguascalientes, and even to Monterey to be smelted.

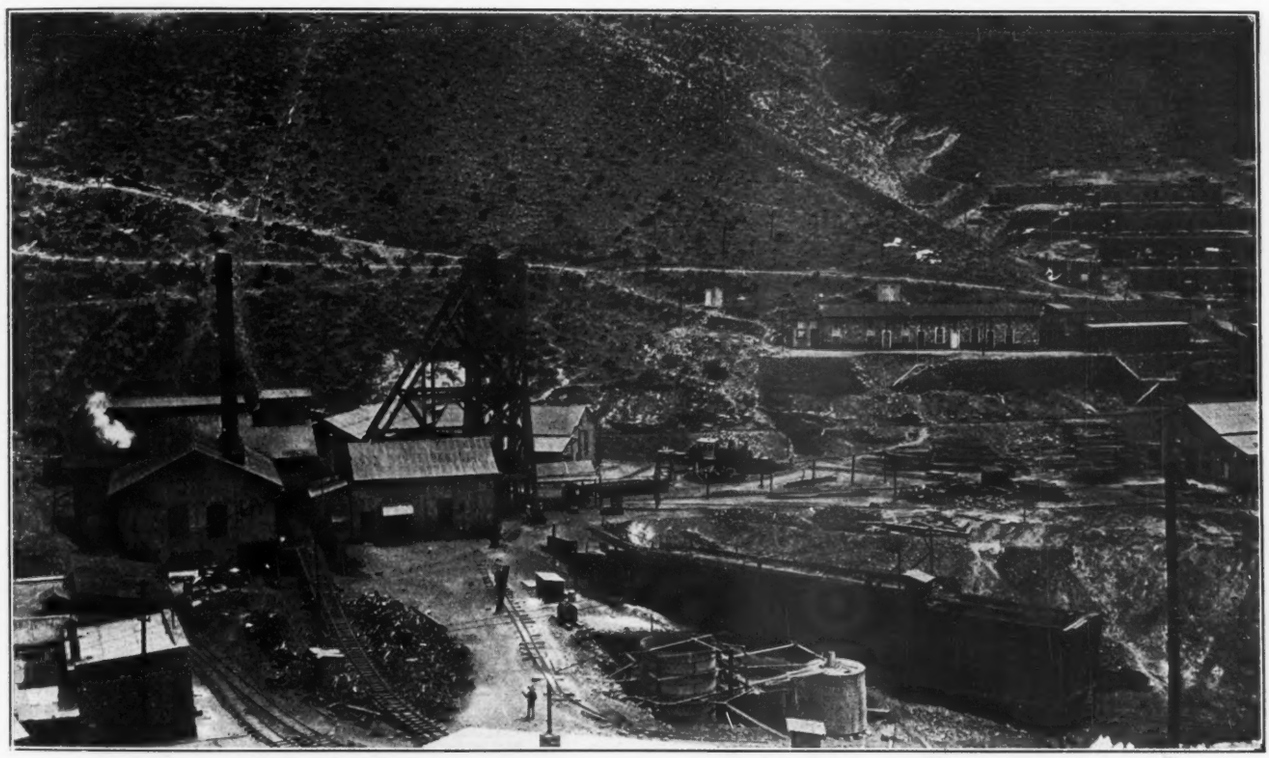
The Santa Eulalia district is about 15 miles east of Chihuahua. Chihuahua is the supply point and shipping point for the district, for it is on the main line of the Mexican Central Railroad. Indeed, Chihuahua is becoming a railroad center for northern Mexico, for it is now a terminal point of three different railroads.

Owing to the fact that there are no good hotels at Santa Eulalia, the visitor to the mines had best sleep at Chihuahua, unless he should be fortunate enough to be invited by some of the superintendents to stay at the mines. At Chihuahua there are three good hotels, the Palace, the Robinson House, and the Ahumada, the first two being, perhaps, somewhat preferable.

Many of the mining companies whose properties are in northern Chihuahua have offices in Chihuahua. In fact the Chihuahua Foreign Club, which has 200 members (full quota) and a large number on the waiting list, is composed mostly of mining men. A mining man visiting Chihuahua should spend a few hours at the Permanent Mining Exhibit, founded by the State in 1904. Here Jorge Griggs, the director, has collected a number of fine specimens, mostly ores from the mines of the State, so that a visitor can obtain much information about the mines by a visit there.

At Chihuahua one meets with signs of the greatness of Santa Eulalia, for the thing that most attracts the attention of the visitor is the magnificent cathedral. This cathedral, with its massive spires and its beautiful carvings, was built between the years 1738 and 1750, with the proceeds from a tax of one *real* per *marco* (about 12c. per 8 oz.) of silver levied on the ore mined from Santa Eulalia.

The figure above the entrance of the cathedral, half of which was shot away during one of the many uprisings through which Mexico has passed, and the cathedral bells, all of which were cracked at some similar time, recall the not-distant past when Mexico was far more turbulent than at present. The cost of this church is variously stated as $800,000 to $1,000,000, and it is said that the building was erected without the use of a derrick; a mound of earth permitted the mules and burros to pack the material up to the very place where it was needed.



SANTA DOMINGO MINE—MIDDLE CAMP

Note—All references to money in this article are in terms of Mexican currency.

JUAREZ MINE, AUTOMATIC LOADING STATION

CALDERANA MINE, SAN TOY MINING COMPANY'S OFFICES IN FOREGROUND

BUENA TIERRA MINE, MIDDLE CAMP

GASOLINA HEADFRAME, SANTA DOMINGO MINE, BUENA TIERRA MINE

History of the District

The Santa Eulalia district is old, but, unless the date of discovery, 1591, given by Jesus Innocente Irigoyen, the historian, is accepted, the district is not old for Mexico. The oldest official papers regarding the Santa Eulalia district bear the date of 1705, and state that the district was discovered in 1703, or 12 years after the founding of Chihuahua.

It is said that the ore was discovered by three prisoners, who, escaping from Chihuahua, fled to Santa Eulalia mountain. Upon finding the ore, supposedly near the Parcionera mine, they sent word by a friendly Indian to the *padre* at Chihuahua that, if he would absolve them and obtain their pardon from the civil authorities, they would show him where he could mine silver ore sufficient to erect the finest cathedral in New Spain. The priest absolved them and obtained their pardon. The fugitives did as they had agreed and in time the Cathedral of Chihuahua was built. This cathedral comes far nearer fulfilling the boast of these fugitives than is generally the case with the vaunts of discoverers.

Many flocked to Santa Eulalia, and soon the town numbered several thousand inhabitants, but then, as now, Chihuahua was the larger and more magnificent.

Up to 1791 the *quinto* (the royal fifth), sent to the King of Spain, was over $100,000,000; at that time 188 *hornos* (small blast furnaces) and 65 cupelling furnaces were in operation at Santa Eulalia, and several others were treating ore at Chihuahua. But during the last five years of the eighteenth century the depredations of the Indians became so serious that the mines were abandoned. At that time the surface ores had begun to show signs of exhaustion. The Mexicans never again fully resumed operations even when the country became more settled, and gradually the production of the mines decreased until Americans revived the industry.

The Ancient Mines

Most of the silver produced by the Mexicans came from the Parcionera, Bustillos, Mina Vieja, San Juan and Santo Domingo mines, but considerable ore was also mined from the San José, Santa Rita, Rosario, Galdeana, San Antonio, Dolores and Las Animas mines. Santa Eulalia lay dormant for many years, and only *gambucinos* worked in the old stopes, extracting a small amount of ore which they treated in the smelters at Santa Eulalia. The deepest of these old workings was about 400 ft. deep, and most of the ore was mined near the surface from open caves so characteristic of the ore fissures near the surface.

About the year 1880, John R. Robinson came to Chihuahua, and recognizing the value of the district obtained possession for himself and Kidder, Peabody & Co. The Santa Eulalia Silver Mining Company was then formed, which obtained a concession from the Government 15 miles long and 5 miles wide, covering all of the Santa Eulalia range.

The company built a small pan-amalgamation mill near Parcionera cañon, but owing to shortage of water this mill was abandoned and a still larger pan-amalgamation mill was built at Hacienda Robinson about 3 miles from Chihuahua where plenty of water could be obtained. But the increasing amount of lead in the ore from the deeper workings and the large tonnage of lead ore which had to be left in the mines rendered it necessary to return to smelting; furnaces were accordingly erected at the *hacienda*.

In 1882 the Mexican Central railroad was completed to Chihuahua; soon after that Mr. Robinson built the narrow-gage railroad, still in use, from the *hacienda* to the mines.

Considerable ore was mined by the Santa Eulalia Mining Company, but in 1891 the company sold to John W. Shaw and Oliver Paine, who formed the Chihuahua Mining Company. At that time most of the ore was mined from the Santo Domingo mine and some from the Galdeana, but the ore in the latter mine was of low grade.

The Old Santa Eulalia Concession

The concession, which covered all the mineral ground at Santa Eulalia, had been obtained as a tunnel concession, and was held by doing annually a certain amount of work upon two adits, one at the north end, the other at the south end of the range. In course of time, the Mexican government passed a law making it necessary to pay an annual tax on each *pertenencia* of mineral ground. Either on account of this tax or for some other reason, no one seems to know why, Mr. Shaw (about 1894) threw up the ground except the Santo Domingo, the Santa Rita, and one *pertenencia* of the Zubiate claim, thinking that he was retaining the richest part of the ground and supposing that, as the company owned the railroad, it would always be able to control the district.

That act, although a colossal mistake on the part of Mr. Shaw, was probably the best thing that ever happened to the district, for it took the land from the control of one who understood very little of the possibilities of the camp, and made it possible for others to proceed with development.

SAN ANTONIO CHICO MINE

TRANSPORTING MINE TIMBERS

The ground released by Mr. Shaw was soon relocated by others who began to develop it. Pedro R. Prieto, a lawyer of Chihuahua, soon struck ore in the Mina Vieja, and afterward he found in the Christo a continuation of the orebody which the Mexicans had worked extensively in the San Juan years before.

Many people were again attracted to Santa Eulalia, and in the last 15 years modern methods of mining have been introduced, mainly by American companies.

Geology of the District

The Santa Eulalia range, which runs northeast and southwest, is an anticlinal dome composed of Cretaceous limestone and capped by a volcanic rock called dacite by Weed, but rhyolite and quartz-porphyry by others. This volcanic rock, whatever it may be petrographically, is locally called *cantera* by the Mexicans and simply porphyry by most English-speaking people in the district; it occurs mainly as

a breccia and a tuff, less often as a massive flow. Included in the porphyry are many pieces of limestone showing the near deep-seated source of this extrusion. It was poured out over the country after the mountain was considerably eroded, as is shown by the fact that it is thickest in many of the present gulches, and by the fact that many islands of limestone project into the porphyry from below.

The Santa Eulalia range rises to a hight of about 2000 ft. above the surrounding plain and attains an elevation of about 7000 ft. It is bare of timber, as is the surrounding country, and devoid of springs, but has been much eroded. The limestone, which composes the mass of the range, is massively stratified and rather fossiliferous. Most of it is blue, but in some parts of the camp, especially near Mina Vieja, the limestone is often grayish and almost white; in many places the limestone carries numerous nodules of chert.

A series of parallel fissures, having a course varying only a few degrees on either side of north, this strike being generally about 20 deg. west, have cut through the limestone and the overlying porphyry. Along these fissures the ore has formed. In some places fissures in the porphyry are ore-bearing, but this is rarely the case, and practically all the workable deposits occur in the limestone.

The Mina Vieja was a notable exception to this statement for the upper orebody, the one mined by Pedro R. Prieto, cut through the porphyry capping and formed a large orebody in that rock. Besides, at the Mina Vieja, in the upper part the ore formed along the contact between the cap rock and the limestone. This was also the case in the upper part of the orebody now called by the Potosi Mining Company the "Tunnel" orebody, and now being worked by that company. But these are exceptions, for the deposits, unlike the orebodies at Leadville, Colo., rarely occur on the contact; instead they are found in the limestone.

Forms of the Orebodies

The ore, as has been said, forms along these northerly-southerly fissures which are approximately vertical, but in some parts show a tendency to dip steeply to the east. The vertical deposits are called *abras* by the Mexicans, and from the *abras*, generally along some bedding plane, lateral enlargements occur. These enlargements, owing to the fact that the limestone strata dip but slightly in the middle and western area, are nearly horizontal, having only a slight dip to the south and east. These enlargements, called *mantas* by the Mexicans, extend sometimes a distance of 100 ft. from the fissure orebody. The *mantas* are often several hundred feet long, but rarely are they over 15 ft. thick and generally only about 3 feet.

The reason for this selective action of the solutions is not evident, and even the mine superintendents who have been longest in the district have no theory as to why certain strata are selected by the *mantas*. The limestone strata in which the *mantas* occur seem to be no softer or no more porous than those strata that were not selected.

Subsequent to the formation of the ore many of the ore channels have been attacked by descending solutions so that open spaces have been formed in the orebodies. These open spaces occur as vug holes in the ore and as caverns above the orebodies. When the orebody is long, these open spaces form long caves of widely varying hight. In some cases these caverns occur where there is no ore, but generally there is much ore along them. The caverns above the orebodies probably are due more to shrinkage of the ore after it has been leached and oxidized by the descending waters than to the corrosive action of the solutions on the lime itself for in many parts of the camp, especially the Middle camp, the size of the open caves is indicative of the size of the underlying orebody.

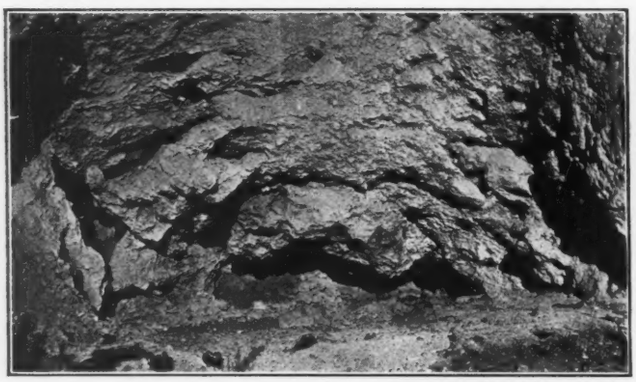
The open caves are one of the peculiar characteristics of the Santa Eulalia district. Near the surface these caves are lined with gypsum crystals, but in depth and sometimes near the surface, the lining is mostly calcite. When new, before blasting has broken the crystals and smoke has soiled the walls, they are extremely beautiful.

The limestone in the camp is very strong, for immense stopes in some of the old mines have stood for years without a single cave. It is said that some of these old stopes are large enough to hold the Cathedral of Chihuahua. In fact in the whole district there has been only one sudden cave, and that in the Mina Vieja when Pedro R. Prieto was working the mine years ago.

This strength of the limestone is important to the district, for, owing to it and to the fact that the Santa Eulalia limestone does not air-slack, as does most limestone, it is possible to work the orebodies by underhand stoping.

The orebodies contract longitudinally, laterally and horizontally, rather abruptly into mere films of ore along the fissure or bedding plane that determined the mineralization. The ore is not disseminated through the inclosing limestone, but a sharp line marks the boundary of the orebody. Often the oxidized ores are encased in a layer, sometimes several feet thick, of galena ore which has not been oxidized.

The orebodies, while they make in *mantas* extending some distance to one side, sooner or later make back again so that with depth the orebodies are fairly vertical.



OLD OPEN WORKING, SAN JUAN MINE

BUSTILLOS SHAFT, SAN TOY MINING COMPANY

Manner of Formation of the Orebodies

Whether the orebodies were formed in open channels or by replacement of the limestone is debatable. The absence of any dissemination in the inclosing limestone and the sharp line demarking the boundaries of the orebodies would indicate a precipitation in pre-existing channels. But the presence of chert scattered through the ore and not confined to the bottom part of the orebody indicates that much of the ore was formed by replacement of the limestone. As the presence of large caves barren of ore proves that such open spaces occur in the limestone, probably some ore was precipitated in previously formed channels and that other ore

was formed by replacement of the limestone. Possibly precipitation in open spaces was confined to the fissures, while the replacing action occurred along both the *mantas* and the fissures.

There are several dikes in the district, in the Democracia claim, the Mina Vieja dike, the one cutting through the San Toy property and extending into Potosi ground, the one cutting through the Buena Tierra property, one in the San Antonio Chico, and another in the San Antonio in the East camp; but dikes are not so numerous as some persons have stated. These dikes are associated with the orebody in the case of the San Antonio and San Antonio Chico, and possibly with the lower orebody of the Mina Vieja, but the dike is said to cut off the upper orebody in that mine. In the Juarez mine a narrow vertical dike cuts through the orebody, but does not displace it.

Whether the mineralization took place prior or subsequent to the formation of the cap rock is not as yet surely known. In the Mina Vieja the fissure and vein were formed after the volcanic activity and prior to the dike; in the San Antonio the mineralization is subsequent to the dike. In the Middle camp the old Rosario contact deposit shows that the capping was prior to the mineralization, but in the Juarez the ore is older than the dike. In many of the properties, notably at the Potosi, there is no indication of the ore-bearing fissures in the porphyry at surface. After considering these facts, although many well acquainted with the district think otherwise, I am inclined to think that the cap rock was formed prior to the mineralization, while some of the dikes represent an igneous activity subsequent to the mineralization. In this opinion, I am strengthened by the fact that there has been practically no faulting in the district since the formation of the ores, although along some bedding planes there has been some movement. This would seen to indicate the absence of any violent volcanic action subsequent to the formation of the ore.

In the treatment of slags from tin-smelting furnaces (English Patent 12, Jan. 1, 1907), the slag, which consists mainly of a small amount of metal together with silicates of iron, tin, calcium, etc., is smelted in an ordinary blast-furnace with the addition, if necessary, of some suitable flux. The iron content of the charge is so arranged that an iron-tin alloy is produced which contains the maximum amount of tin which can be obtained from the slag without undue loss of the metal. For this reason it may be necessary to mix the slag with a calculated quantity of some iron ore. The alloy so obtained is afterward treated, electrolytically or otherwise, for the production of metallic tin.

Butte Coalition Mining Company

The report of the Butte Coalition Mining Company, of Butte, Mont., for the year ending Dec. 31, 1907, shows that the Red Metal company produced 377,240 tons of ore, which yielded 51.47 lb. of copper and 1.18 oz. of silver per ton, or a total of 19,416,377 lb. of fine copper, 444,809.51 oz. of silver, and 2,479.99 oz. of gold. The net income was $1,461,-465.44. The Alice Gold and Silver Mining Company, which is controlled by Butte Coalition, was not operated in 1907, except in a small way by leasers.

The mines operated during the year directly by the Red Metal company were the Rarus, Minnie Healy, Tramway and Corra. Other mining operations in property in which the company is co-owner were carried on from convenient plants and shafts of the Amalgamated companies, chief among which were the West Colusa, Pennsylvania, Leonard, and Mountain View shafts of the Boston & Montana; the Parrot shaft of the Parrot Mining Company, working the Nipper mine; the Berkeley shaft of the Butte & Boston Mining Company, mining in Snohomish ground; and the Diamond shaft of the Anaconda Copper Mining Company, in the Parnell mine. All these mines except the Minnie Healy worked continuously during the year up to the middle of September when, in common with all the Butte mines, production was reduced 65 per cent.; Dec. 1 production ceased entirely for the remainder of the year, the mines not reopening until March 1, 1908.

During the period of inactivity at the Rarus, development work was vigorously pushed; the principal work was done on the fifteenth, sixteenth and seventeenth levels, and in sinking the shaft, now bottomed 105 ft. below the 18th level. The most important developments in the Rarus were the opening up of the two main veins on the sixteenth level.

Production in the Minnie Healy was interfered with June 25, 1907, by a fire which had made itself known some weeks previously in old workings to the north. About 30 per cent. of the usual ore output was, however, mined from the Minnie Healy after this interruption and hoisted through the Boston & Montana company's new Leonard shaft. This was done at considerable disadvantage and with extra cost and in the middle of September the entire production from this mine was stopped, awaiting the completion of the Tramway shaft, which had been in process of sinking for several months. The fire situation was taken charge of by the Boston & Montana, some of whose properties were affected, and for some months it has been under control and confined to a small area outside of the Minnie Healy claim. Gas still remaining in the Minnie Healy workings, which are otherwise unaffected by the fire, prohibit mining operations until ventilation is provided. This is being accomplished by the Boston & Montana company in sinking air shafts on its property to the north of the Minnie Healy. The development work of the Minnie Healy orebodies below these workings is being done by crosscuts from the Rarus and Tramway shafts; the latter at this time is 1500 ft. deep, or 350 ft. below the bottom level stoped from the Minnie Healy shaft.

At the Corra mine, the main shaft was sunk to the eighteenth level, and 1119 lineal feet of drifts, raises and crosscuts were driven previous to the shut-down at the end of November.

At the Tramway, development consisted in part in sinking the four-compartment shaft, its size in the clear being 5x18 ft. 10 in. There were sunk during this period 326 ft., all compartments being sunk together; also 131 ft. sunk in one compartment, 731 ft. raised in one compartment, and 89 ft. raised in two compartments; 1188 ft. of the shaft were retimbered with shaft timbers replacing the small raise timbers. In addition to the shaft sinking, stations were cut at the eleventh and fourteenth levels, and 2333 ft. of crosscutting and drifting were done in Tramway ground from the Rarus shaft, from the Tramway shaft and from Minnie Healy workings.

On the properties owned jointly by the Red Metal and other companies, the West Colusa, Pennsylvania, Mountain View and Leonard, of the Boston & Montana company, furnished the principal part of the production from the ground owned in common. At the Nipper and Snohomish work was confined to development, the ore shipments from these two properties coming entirely from the exploiting drifts.

In a method for the manufacture of aluminum (H. Herrenschmidt, French Pat. 383,554, Jan. 10, 1907) crude bauxite is powdered and dehydrated. The hot material is mixed with boric acid or a borate, preferably borax (about 8 per cent.) and a quantity of carbon (coke, charcoal, etc.) calculated to be sufficient for the reduction of the iron and silicon contained in the bauxite. The mixture is fused in an electric furnace, iron and silicon being reduced and forming compounds with boron, while the alumina is merely melted. The fused oxide is then run into a second furnace, or into another part of the first furnace, where it is reduced to aluminum as usual (after the addition of cryolite, etc.)

Consul-General Robert P. Skinner, of Marseille, reports that the declared value of bauxite exported to the United States from the Marseille district during the years 1905, 1906 and 1907 was $50,162, $55,787 and $108,207, respectively.

Reverberatory Smelting of Copper Ore—II

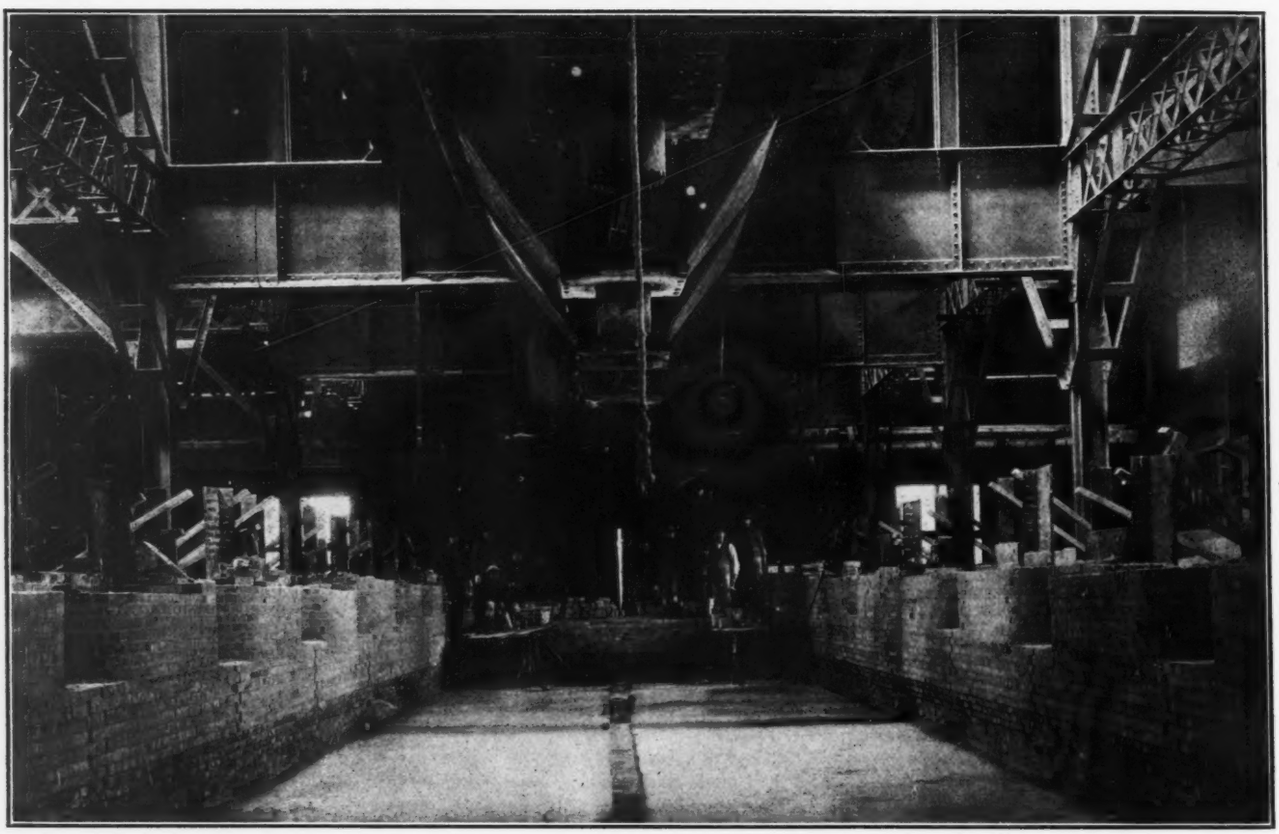
Application of the Reverberatory Furnace to the Reduction of Copper Ores. The Latest Furnace at Anaconda as an Example of Practice

BY C. OFFERHAUS*

(*Continued from page 1193*)

The charge is dropped into the furnace from two hoppers, confined to the first 20 ft. from the firebridge. Charging all over the hearth as formerly practiced is abandoned. The discharge openings in these two hoppers correspond with four holes in the roof, closed with circular covers. At the proper time the side door nearest the firebridge is opened, and a rabble is inserted to feel if the previous charge is fused. The side door is then promptly closed and sealed with sand. In the meantime the circular covers are lifted and pulled to one side, the gates, which close the hoppers are pulled out, and a charge of 15 tons (about 10 tons from the first and 5 tons from the second hopper) is dropped into the furnace. Then the holes are re-covered and carefully sealed with sand. The length of the hearth gives the dust plenty of time to settle down. The operation of charging including the opening of the side door takes five minutes, as Table II shows. As soon as a charge has fused, a fresh one is dropped. Table II shows furthermore that seven charges were made during this shift. It is found, however, that on the average a charge of 15 tons can be made every 80 minutes. The bulk of the material charged is calcines from the McDougal roasting furnaces; its temperature entering the hoppers of the reverberatory furnace is 420 deg. C. All flue-dust produced by the plant as blast flue-dust, McDougal flue-dust, main flue-dust (from the main flue), residue flue-dust (from the As_2O_3 plant) and converter flue-dust is charged into the reverberatory furnace. The skimmer does not know what material he has charged until the following day, when the daily report comes in.

In charging considerable flue-dust, he finds, however, that he is not able to make as many charges as ordinarily. Blast flue-dust melts down easily, the easiest of all, then follows converter flue-dust, main and residue flue-dust and finally McDougal flue-dust, which follows blast flue-dust as regards quantity. The dropped charge falls on a layer of at least 4 in. of matte with about 8 in. of slag on the top of it, consequently does not reach the bottom, and sticking of the charge to the bottom—one of the main obstacles in older practice—no longer occurs. The hot charge spreads itself more or less rapidly, without the help of tools, a property of all hot and powdered substances. The charge is heated from above by the flame, from below by the overheated molten bath, and melts down rapidly.



REVERBERATORY FURNACE UNDER CONSTRUCTION

Skimming

The furnace is skimmed every four hours, that is twice by each shift. Between the skimming and the last charge, there should be an interval of at least 40 minutes. The skimming door in front of the furnace is removed and the sand dam on the door-sill is cut open, so as to allow the slag to flow out. A cast-iron skimming plate, the top of which is 13 in. above the tap-hole level, prevents the

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door-sill from wearing away and keeps it at a constant level. The slag flows first in a cast-iron slag-pot (a settling trough 7x24 in. and 18 in. deep, intended to retain matte) and the overflowing slag stream is cut by a powerful stream of water (slum water from the mill leaving a slightly flattened 8-in. pipe) which granulates it and conveys the granulated material through a cast-iron lined launder to the dump. The average temperature of the slag leaving the furnace is 1120 deg. C., and measured at the overflow of the slag-pot, 1060 deg. C. Slag samples are taken at the overflow. The slag should flow as rapidly as the water can handle it, in order to have the door opened as short a time as possible. The cold air entering the skimming door is carried directly up the flue and consequently is found to be less harmful than the cold air entering the furnace at more remote parts from the front. The rabble (blade 5x9 in.; handle 12 ft.) is used to pull the slag or to regulate its flow, depending upon its level. In pulling the slag the handle of the rabble (well soaped) slides over a horizontal iron bar which is attached to the furnace in front of the skimming door. Floaters (unfused or baked charge or high silicious material) are pulled out with hooks or pushed back, depending upon their size and quality. Floaters appear frequently after fresh claying of the furnace, and also if the charge runs too high in sulphur. In the latter case the proper division of the iron between matte and slag is disturbed. There results a low-grade matte. The slag-forming materials contain silica in excess of the desired composition of the characteristic slag for the temperature obtained. The practical smelter says that the matte has robbed the iron from the slag. The latter is not able to take up the resulting excess of silica. The time used in skimming is from 15 to 20 minutes, in which 40 to 60 tons of slag is drawn off. The skimmer speaks of skimming two or three "rabbles," meaning the time in which the rabble gets soft, bends, and has to be replaced by a fresh one. In throwing up the slag with the rabble, the matte may be seen, especially at the end of the skimming. It needs some experience to recognize the matte from the slag at this temperature. The color of the matte is somewhat darker and it has a slight metallic luster. It is well to know at all times approximately how much matte is in the furnace, to avoid the pulling out of same, which causes terrible explosions in contact with water. The level of the slag being sufficiently low, the flow of the slag is cut off by placing a rabble with a large blade (6x16 in.) in the doorway and building up a dam of sand against it. The rabble is then removed, the door replaced on the sand dam and the remaining openings are closed up with a few shovels of damp sand. Then the slag-pot is tapped by opening a hole near the bottom. A sample of this pot-slag goes to the assay office. The material remaining on the bottom of the slag-pot might contain matte and goes to the blast furnace as slag chips.

Tapping

Matte is tapped if the converter plant is in need of it, or if the level of the matte unexpectedly reaches the top of the skimming plate. In the latter case a direct tapping is required and if there are no ladles at hand, the matte is tapped in a hole in the sand outside the building. This matte is broken up later on and shipped to the blast furnace as matte chips. There is a tap-hole at each side of the furnace a short distance from the firebridge. The slope from the front to the tap-hole is 8 in. The tapping plate

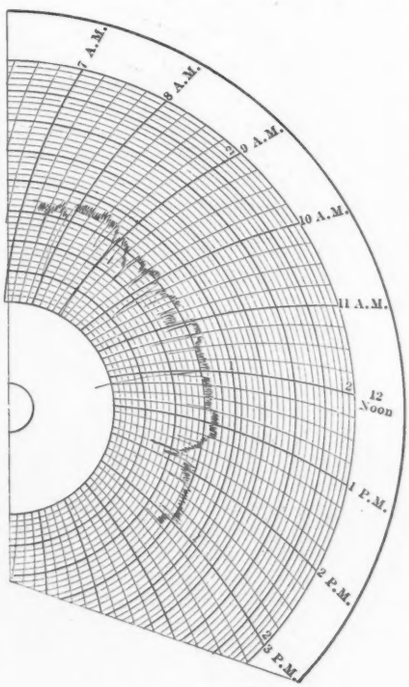
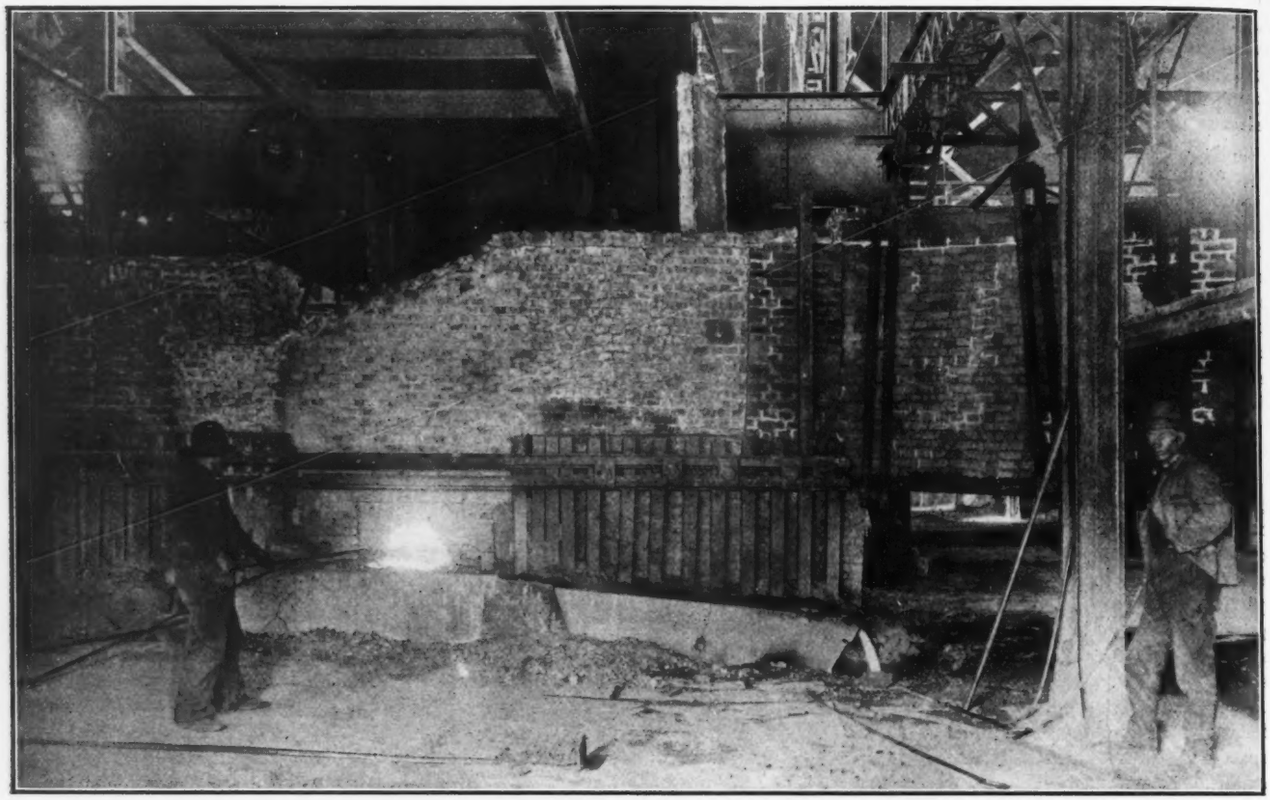


FIG. 3. DRAFT PRESSURES

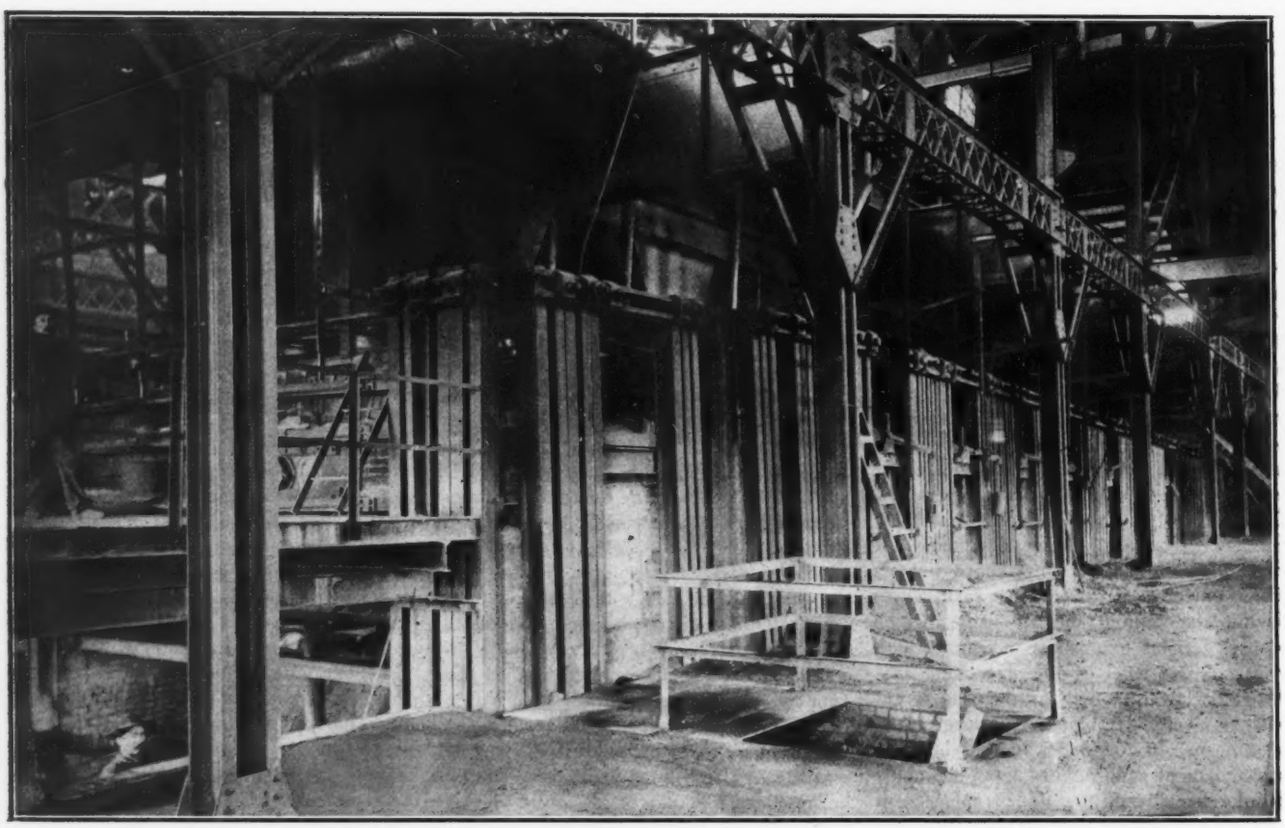
is of copper; it is 24x24x2¼ in., cast from converter copper and lasts about five months. A cast-iron runner leads from the tap-hole to the outside of the building (firebox side), discharging above the ladle track. In tapping one or two ladles (a ladle takes 7 to 10 tons), the runner does not get hot enough to be dissolved noticeably. It takes about 15 minutes to tap two ladles. In tapping a furnace dry, the runners are lined with a silicious material (Dillon quartz, a sand containing 95 per cent. SiO_2). Every ladle is sampled; the sample is taken out of the runner. The ladles are lined with a thin layer of a silicious ore mixed with just enough pond-slum to make it thoroughly plastic. A fresh-lined ladle is dried by burning scrap wood inside of it and is first used at the reverberatory furnaces, matte of these furnaces not being so hot as blast-furnace matte. The temperature of the matte leaving the reverberatory furnace is 1035 deg. C.; it enters the ladle at a temperature of 935 deg. C. A ladle once used is called a "lined-out ladle." It is impermeable to water and is then also used for blast-furnace matte. In tapping two or more ladles the matte stream is not cut off while moving the empty ladles at the place of the full ones. Little matte is spilled on the floor in this way; it goes, together with the runner cleanings, to the blast furnace as matte chips. The tap-hole is stopped up by means of a conical fireclay plug, stuck on a dolly. One man inserts the plug and another hammers it in by knocking on the end of the dolly. A pointed iron rod is then driven through the fresh fireclay, until it reaches the matte. The iron rod is slowly dissolved by the matte; and for this reason it is knocked in somewhat from time to time. If upon knocking against it, it does not feel free and is not heard to be free, it is a sign that the rod no longer reaches the molten matte. First one tries to knock it in again by force. If this is not possible, it is knocked out and replaced with chisel-pointed bars. If a limited time of hammering does not open the hole, an air drill is applied. As soft material is reached, the drill is removed and a pointed iron rod is hammered in, without spilling any matte.

Fig. 3 is an autographic record of the pressure (in inches water) above the firebridge, covering the eight-hour shift under discussion. The furnaces run on natural draft. The draft measured above the firebridge should average to 0.85 in., measured where the different flues of the reverberatory furnaces enter the main reverberatory flue it varies from 1.7 to 2 in.; (2 in. in winter time). Following this curve, at the same time observing Table II, the influence of the different operations on the draft is clearly seen. We notice that the dropping of the calcine checks the draft almost entirely. Charging coal is also quite noticeable. This curve is a means of checking the management of the furnace. Table III represents the daily report of the shift under discussion and the two following ones. It covers 24 hours and shows (see furnace No. 1) that there were charged 212.3 tons of calcine, 16.2 tons of blast flue-dust, 9.7 tons of residue flue-dust and 60.5 tons of coal; 3.93 tons cupreous material were charged per ton of coal. The same table shows that the plant smelted on an average 4.34 tons cupreous material per ton of coal. We will recollect, however, that 10 per cent. of the coal is recovered as fines and a part of the heat is utilized in making steam.

Table IV is the assay report covering the same 24 hours. It gives us the average analysis of the MacDougal calcines, the main charging material, the average analysis of the slag and the concentration



SKIMMING REVERBERATORY FURNACE



REVERBERATORY FURNACE, FROM FRONT END

of the matte produced (46 per cent. Cu). Regarding the concentration of the matte it may be mentioned that the converters prefer a matte with about 45 per cent. Cu. The desired concentration will, however, also depend upon the stress one desires to lay on the roasting furnaces, reverberatory plant and converter plant respectively. The Cu content of the reverberatory furnace slag of furnace No. 1 during the first shift was 0.35 per cent., and that of the pot-slag 0.30 per cent. The average Cu content of the reverberatory furnace slag was that day 0.35 per cent. We will notice that the average composition of the pot-slag does not differ from that of the reverberatory slag. This is generally the case. The copper in the slag is practically present in the form of matte, and the low copper content of the slag in comparison with the older practice is mainly due to the size of the furnace and its higher and more constant temperature which enables the matte to settle fully from the large quantity of molten materials.

Starting up a Reverberatory Furnace

In starting up a reverberatory furnace, scrap wood is fired on the grate for a long time, gradually replacing it with coal. The distance from the middle line of the roof of the furnace to some fixed points of the structure of the building is constantly measured and the tie-rods over the roof are gradually unscrewed, not allowing the roof to rise more than 2 in. If local irregularities occur, they are kept down by iron rods supported against some part of the building structure. After two days the first charge is dropped and as soon as it is melted it is followed by a second and so forth. The following table, No. V, refers to the starting up of a reconstructed reverberatory furnace.

TABLE V. STARTING UP A REVERBERATORY FURNACE.

July.	Coal, Tons.	Total Smelted, Tons.	Cu-Metal. Smelted per ton of Coal.
23	14.4	.....	....
24	39.6	35.3	0.89
25	52.4	54.1	1.03
26	50.1	76.7	1.53
27	53.1	120.0	2.26
28	52.2	104.8	2.00
29	56.4	118.4	2.10
30	52.2	125.5	2.41
31	55.3	237.1	4.29
Aug.			
1	53.4	245.5	4.60
2	56.3	245.6	4.36

It shows that it takes about one week to get the furnace on full capacity and in economical working condition. The furnace is not tapped before it contains a charge of about 250 tons. The life of the bottom of a modern reverberatory furnace, properly operated, is practically unlimited. The walls and roof near the firebridge need repairing or reconstruction about every eight or nine months and about every two years the side walls and roof are torn down and rebuilt.

Claying a Reverberatory Furnace

It is found that the Anaconda reverberatory furnaces need claying in the proximity of the firebridge only. This part needs re-claying about every month. The front of the furnace is not exposed to direct action of the oxides of the charge and the temperature here is lower. The five doors nearest the front are blind. The color of the conker-plates in the firebridge channel indicates the condition of the firebridge. This channel, which is intended to cool the firebridge is open at one end and at the other it is connected with the flue. For more efficient cooling a pressure air pipe is inserted. If the conker-plates get red hot inside, it is a sign that the furnace needs claying. The matte is allowed to rise to the upper level of the skimming plate. The slag is skimmed off as clean as possible and the matte is tapped in proportion to the needs of the converter plant. Preparations have been made to handle this matte (about 20 ladles from 7 to 10 tons) as quickly as possible. It takes several hours, however, to tap the furnace dry. The two or three side doors at each side of the furnace nearest the firebridge are then opened and about 20 tons of sand (Dillon quartz, a self-baking sand containing 95 per cent. SiO_2) are thrown in against walls and firebridge. Though all the men available are used, in order to perform the claying as quickly as possible, the furnace cools down considerable by cold air entering the doors.

Older Type of Furnaces

Being now acquainted with the modern reverberatory furnace and its running, we may discuss briefly the older type furnace. The older reverberatory furnaces were not only smaller in size, but their relative proportions—the proportion between area of grate and area of flue—were not suited to obtain the rate of combustion necessary to get the desired temperature with ease. The furnaces were not so strongly built and reinforced as our present ones and poor brick was often used. In a 30-ft. furnace about five charges of five to six tons could be made in 24 hours. After the melting

TABLE III.
(Daily Report Reverberatory Furnaces.)

Furnace Number.	Coal Tons.	Total Smelted Tons.	Calcine Tons.	McDougal Fluedust Tons.	Blast Fluedust Tons.	Residue Tons.	Cu-material Smelted per Ton Coal.	Boiler Working Hours.	Ladles Matte in Furnace at End of Day.
1	60.5	238.2	212.3		16.2	9.7	3.93	24	6
2	53.7	252.9	234.7		18.2	...	4.70	24	4
3	64.2	258.4	227.9	7.9	19.5	3.1	4.02	24	4
4	57.4	268.0	253.1		20.2	12.7	4.98	24	6
5	64.2	253.2	253.2		....		3.94	24	6
6	50.0	263.2	253.2		9.9		5.26	24	6
7	....	.....	.....		....		....	..	.
8	67.6	243.3	222.9		20.4		3.59	24	6
Total.	417.6	1795.2	1657.4	7.9	104.4	25.5	4.34	168	38

Draft, 1.7 in.
Number of charges, 123.
Number of ladles of matte tapped, 24.
Number of furnaces running, 7.
Cupreous material smelted per furnace, 256.45.

TABLE IV. REVERBERATORY FURNACES.
(Assay Report.)

Description.	Furnace Number.	Per Cent. Cu. 1st Shift.	2d Shift.	3d Shift.	Per Cent. SiO_2.	Per Cent. S.	Per Cent. CaO.	Per Cent. FeO.
Average in McDougal Calcines			8,—		29.5	7.3	2.6	36.9
Reverberatory slag	1	.35	.20	.20				
	2	.35	.45	.30				
	3	.30	.35	.35				
	4	.25	.25	.20				
	5	.40	.30	.35				
	6	.55	.30	.35				
	7	...	...	...				
	8	.30	.30	.60				
Average in slag		.35	.30	.35	38.6		3.5	41.9
Reverberatory matte			46,—					
Reverberatory potslag	1	.40	.35	.30				
	2	.25	.25	.30				
	3	.20	.30	.30				
	4	.20	.25	.30				
	5	.30	.30	.25				
	6	.45	.30	.30				
	7	...	...	...				
	8	.30	.30	.35				
Average in potslag		.30	.30	.30				

down of every charge the slag was skimmed clean and every 24 hours the furnace was tapped dry and clayed. The reason that so few charges could be made (about 2.5 tons cupreous material required one ton coal) was, that a long time of violent firing was necessary to overcome the last 200 or 300 deg. C., in the melting region and these 200 or 300 deg. were then rapidly lost in grating, skimming, charging, and especially in leveling the charge and removing crusts from the bottom with doors open. The hindering influence of these different operations is much less in a large furnace than in a small one, and also these operations are not as frequent; and this is one of the principal reasons why it is possible to work these large furnaces so economically.

The frequent variation in temperature damaged the smaller furnaces far more than the constant, though higher, temperatures of our modern furnaces. The comparatively weak construction, and this frequent variation in temperature, caused the formation of cracks and made it impossible to keep a large weight of matte on the bottom.

TABLE VI. MONTHLY REPORT.

	Tons Charge	% SiO_2	Tons.	% FeO	Tons.	% CaO	Tons.	% S.	Tons.	% Cu.	Pounds.
Calcine and limerock	50,679	27.7	14.038	39.0	19,765	2.4	1216	8.–	4055	8.66	8,261,922
McDougal fluedust	1,129	29.0	327	21.8	246	0.9	10	14.3	161	7.74	174,807
Main fluedust	771	30.2	233	17.4	134	2.7	21	10.0	77	6.79	107,403
Blast fluedust	3,116	35.5	1,111	24.0	748	3.–	93	6.2	193	6.25	389,734
Residue fluedust	204	29.4	60	15.0	31	2.3	5	8.1	17	6.40	26,566
Converter fluedust	139	2.0	3	6.3	9	...	..	12.4	17	71.23	197,839
	56,038		15,772		20,933		1345		4520		9,158,272
Matte to converter	10,409			34.7	3,612			25.–	2602	40.98	8,531,270
Matte chips to blast	31	8.2	3	37.0	12	0.8		20.2	6	31.93	20,018
Slag chips to blast	477	39.3	187	43.1	205	2.9	14	1.4	7	2.42	23,073
Dust to main flue	15	30.–	4	16.9	2	2.6		9.6	2	8.75	2560
Deduct from above totals			194		3,831		14		2617		8,576,921
To slag			15,578		17,102		1331		1903		

Slag Calculation.

		Actual Analysis.
SiO_2 in slag	15,578 = 38.60 per cent. (calculated).	38.20 per cent.
FeO in slag	17,102 = 42.30 " " "	43.10 " "
CaO in slag	331 = 3.30 " " "	2.90 " "
	34,011 84.20	84.20

corresponding with 40,393 tons slag; is 84.2 per cent. of total slag.

Monthly Balance of the Anaconda Reverberatory Plant

In order to get an exact idea of the quantity of the different materials charged and their average composition we have Table VI, which is a slag calculation of the reverberatory plant (containing eight furnaces of about the same size as that described) covering one month. We notice that the bulk of our charge consists of calcine and lime-rock, the product of the roasting furnaces. The MacDougal roasters receive all the fine concentrates from the mill, part of the screenings from the first-class ore (smaller than ⅜ in.) and about 3 per cent. of fine lime-rock, material that passed through a grizzly at the storage bins for the blast furnaces. In passing the MacDougal roasting furnaces, these materials are dried, mixed and roasted. The lime-rock makes the reverberatory slag somewhat lighter and more fluid. Originally it was added because it was believed that it made the roasting more efficient. The size of the materials charged into the reverberatory furnace is limited and depends upon the temperature reached. An average screen analysis of the MacDougal calcines shows that 10 per cent. does not pass a 10-mesh screen, 25 per cent. is between 10- and 30-mesh, 30 per cent. between 30- and 80-mesh, and the rest finer than 80-mesh. The flue-dust from all over the plant is charged into the reverberatory furnaces exclusively. We notice that blast-furnace flue-dust occurs in the greatest quantity, there being 3.116 tons; then follows MacDougal flue-dust, main flue-dust, residue flue-dust (the residue from the As_2O_3 plant), and converter flue-dust. The total flue-dust amounts to about 10 per cent. of the charge. Regarding the composition of these different kinds of flue-dust we notice the MacDougal flue-dust runs rather high in sulphur, as would be expected, converter flue-dust runs high in S and very high in copper.

With the help of the data given in Table VI, we will calculate how much S escaped as SO_2 on an average during a period of one month, in order to gain a quantitative insight into the reactions, which occur in reverberatory smelting.

The total charge amounts to 56,038 tons with 4520 tons S and 9,158,271 lb. Cu.

From this we deduct the following outgoing materials:

Matte chips	31 tons with	6 tons S. and	20,018 lb. Cu.
Slag chips	477 tons with	7 tons S. and	23,073 lb. Cu.
Flue-dust	13 tons with	2 tons S. and	2,560 lb. Cu.
Total	521 tons with	15 tons S. and	45,651 lb. Cu.

Deducting these totals, we have 55,517 tons with 4505 tons S and 9,112,620 lb. Cu. We produce 8,531,270 lb. copper in the form of matte. Therefore, 9,112,620 — 8,531,270 = 581,350 lb. copper is lost, mainly with the slag in the form of suspended matte. The matte produced contains 40.98 per cent. Cu and 25 per cent. S; with the 581,350 lb. copper we lose, therefore, 354,654 lb. S = 117.3 tons of S.

$$\left\{\begin{array}{c} 581{,}350 : X = 40.98 : 25 \\ X = 354{,}654 \end{array}\right\}$$

The reduced charge of 55,517 tons contains, therefore, 4505 — 117 = 4328 tons S and 8,531,270 lb. Cu = 4266 tons of Cu. That is 7.8 per cent. S. and 7.68 per cent. Cu, which we might expect to find in the form of matte, if no internal reactions occur, which reject S in the form of SO_2. The proportion of Cu to S in the matte is 48.98 to 25. The sulphur of the charge in excess of this proportion will escape as SO_2.

$$\left\{\begin{array}{c} 40.98 : 25 = 7.68 : X \\ X = 4.68 \end{array}\right\}$$

Therefore, 7.8 per cent. — 4.68 per cent. = 3.1 per cent. S goes off as SO_2. This is 40 per cent. of the sulphur present.

It is found that the escaping reverberatory furnace gases contain 2.3 per cent. SO_2 during the first 10 minutes after a fresh charge is dropped, afterward about 1 per cent. constantly. Only traces of SO_3 can be detected.

Assuming that all the copper lost is lost with the slag, the average Cu content of the slag would be 0.7 per cent. Cu as calculated from Table VI. In this table an estimate was made of the calcines in the hopper, the matte in the furnace and copper in the furnace chips. This is liable to error, and the average analysis will, therefore, show usually a lower figure and will be more correct in this case. The average copper content of the reverberatory slag for the year 1906, was 0.35 per cent. Cu and for the first six months of 1907, 0.36 per cent. Cu. The copper lost amounts to 6 per cent. of the copper present in the charge as calculated from Table VI; in fact, it varies on a six months' basis, from 3 to 6 per cent. and 5 per cent. may be assumed as a safe loss. In all, 55,517 tons of charge contining 8.2 per cent. Cu produce 10.409 tons of matte with 40.98 per cent. Cu. The ratio of concentration is therefore

$$\frac{40\ 96}{8.21} = 5.0$$

and the matte-fall 20 per cent., or one-fifth.

We notice that the weight of the slag amounts to more than four times the weight of the matte, and it will now be easily understood that the quantitatively dominating reactions in reverberatory smelting are

$$3\ Fe_2O_3 + FeS = 7\ FeO + SO_2$$
$$FeO + x\ SiO_2 = FeO.\ x\ SiO_2.$$

Present Mining Conditions on the Rand

Consolidation of Operating Plants and Reduction of Working Costs Promise to Insure the Prosperity of the Mines for Many Years

BY THOMAS H. LEGGETT*

In a paper entitled, "Deep-Level Shafts on the Witwatersrand, with Remarks on a Method of Working the Greatest Number of Deep-Level Mines with the Fewest Possible Shafts," presented to the American Institute of Mining Engineers in August, 1900, I drew attention to the great cost of sinking the very deep vertical shafts that were then being seriously proposed as necessary for the development of the deeper areas, pointing out the strong advisability of working this ground by means of inclines to be sunk from the existing shafts of from 3000 to 4000 ft. in vertical depth. In this paper it is stated: "In short, practice upon the Rand now tends toward fewer vertical shafts and more underground inclines, especially for the very deep mining about to be undertaken."

In consequence, the 6000-ft. vertical shafts, at one time so much discussed, have never been started, and they do not now seem likely ever to be.

The necessity of placing all deep shafts further apart in order to make them control and exhaust larger areas was also dwelt upon. This economy was vitally necessary for both financial and technical reasons, very few of the deep shafts being operated to anywhere near their full efficiency, and to further this object the advisability of amalgamating many of the deep-level companies was pointed out.

The hard times that the Rand has been going through during the past few years, have emphasized these points very strongly, with the result that the very deep vertical shafts are no longer suggested, while the amalgamation of a large number of the deep-level properties has already been consummated and other amalgamations are under way. There were many deep-level companies formed 8 to 10 years ago with areas of from 200 to 300 claims (from 280 to 240 acres), which were to be developed by means of vertical shafts placed about 2000 ft. apart. Many of these properties have been amalgamated, so that the areas are now two or three times the above extent, while wherever possible the distance between shafts has been increased to from 3000 to 4000 feet.

In some instances, properties of large area are being opened up by a single deep shaft, which is permissible where connections can be made with adjoining properties, so as to give the two exits required by the Transvaal law.

Under these conditions, several years ago, I started a single seven-compartment shaft to be sunk approximately 4000 ft. to develop a property of 254 claims (about 356 acres), each of the six hoisting compartments being 5x6 ft. inside of timbers, and the pump- and ladder-way 6x6.5 ft., and, as stated, several similar single shafts have since been started.

In short, economy in all directions is the order of the day, and necessarily so, since new capital is not easily found for defraying the cost of expensive deep-level development.

Consolidation of Knights Central and South Knights

An excellent instance of the amalgamation of deep-level properties, already mentioned, is the consolidation of the Knights Central, Ltd., with the South Knights, Ltd., now under way.

The Knights Central has an area of 444 claims (622 acres), a capital of £525,000, and is developed by means of two five-compartment shafts, about 2000 ft. apart, and about 2200 ft. deep each. This company, today, has 282,000 tons of ore developed, assaying about 8 dwt., over an average width of reef of 4 ft., which is a highly payable grade of ore, but it has only about £50,000 cash in hand, or not nearly enough to build the necessary 200-stamp mill and cyanide plant, and to carry on further mine development.

The South Knights property has an area of about 450 claims lying on the dip of the Knights Central reef or adjoining that property on the south, where its shallowest depth of reef is about 5000 ft., and it has a paid-up working capital of about £300,000 cash in hand. This amount of money is quite inadequate for the necessary shaft sinking, shaft equipment and the mine development, to say nothing of the subsequent milling plant. In the present strenuous times it would be impossible to raise additional capital, as is evidenced by the fact that not a sod has been turned upon the property, although the company has had nearly $1,500,000 cash in hand since its formation several years ago.

The combining of these two properties gives an area of 894 claims (1250 acres), insures a very long life to the enterprise, and furnishes the necessary funds for bringing the property to a producing stage, since the cash in hand will then amount to £350,000. It also puts the shareholders of the deeper property within measurable distance (probably 12 or 15 months) of receiving a return upon an investment which has already lain fallow for five years, and which, could they succeed in raising the additional capital necessary to bring it to fruition, would still require 6 or 7 years more.

Financial Conditions

It is pertinent to touch upon the financial aspects of these consolidations, not only because the mining business, like all others, is governed by them, but also because one of the leading mining journals of the United States has published the statement that the mines of the Witwatersrand were greatly overcapitalized. I believe it is demonstrable that the majority of these companies are not overcapitalized.

In the consolidation of the two properties mentioned above the Knights Central issued £375,000 fully paid £1 shares in payment to the South Knights for its entirely undeveloped property and its £300,000 in cash. The South Knights has a capital of £650,000 (in £1 shares), of which but £500,000 are issued, including 150,000 shares working capital guaranteed at 35s., this latter feature being the cause of the present large amount of cash in hand.

It is evident that the deeper property suffers a large shrinkage of valuation by this consolidation; it is almost invariably the case that the company owning the deeper and generally largely undeveloped property has thus to suffer in these amalgamations.

With respect to this very deep level ground, the engineer earliest on these fields, Hennen Jennings, was always very cautious, while John Hays Hammond uttered a note of warning in 1901, with which all conservative engineers on the Rand agreed, when he said:* "The results of the developments in the deep-level areas have been so satisfactory as to engender a certain recklessness on the part of mining companies owning very deep reefs. The exploitation of certain of these areas is not regarded by conservative engineers as at present justified, in view of the large intervening tracts of undetermined value which separate mines in operation from the site of proposed mining upon these very deep-level areas."

The redeeming feature of the formation of companies on these deeper areas was the invariable provision of a good round sum for a working capital, as in the case of the South Knights, and such was the faith of the issuing house in the value of

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NOTE—From a paper presented at the New York meeting of the American Institute of Mining Engineers, February, 1908.

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*_Trans._, A. I. M. E., XXXI, p. 852 (1901).

these properties that this working capital was guaranteed at prices usually much above par.

The result has been, however, that by far the major part of this working capital has had to be paid by the guarantors (not a pleasant position when the same shares can be bought today for one-fourth to one-sixth of the guaranteed price), and this liability can never be avoided, not even by the liquidation of the company.

It speaks well for the character of the financing upon the Rand that none of these deep-levels was floated without this provision of immediate working capital and in large sums. The consequence is that the deeper companies are in the position to make much better terms when combining with their northern neighbors than otherwise would be the case, while to this amalgamation many of them must inevitably come for the reasons already given.

No Overcapitalization

With reference to the alleged overcapitalization of the Witwatersrand companies, a record of the dividends paid by 47 of them (all the data that is now readily available) for the year 1907 shows an average of 44 per cent. on the aggregate capital, while certain properties did much better, as, for instance, the Crown Reef, 210, and the Ferreira, 300 per cent. The Rand Mines, Ltd., comprising a group of nine producing deep-level mines, paid 130 per cent. in dividends in 1907, and promises to increase this rate during 1908. According to Ross Browne, the total expenditure in shafts, development, plant and equipment by these nine companies, before reaching the producing stage, averaged £620,000 per company; consequently, a very considerable capitalization is warranted.

The report of the Mines Department of the Transvaal for November, 1907, shows 71 mines "dropping stamps" on the Rand; hence, it is evident from the foregoing that the majority of these mining companies are far from being overcapitalized.

It is undoubtedly true that the stock market has overcapitalized these companies several times, and probably this fact has led to a confusion of ideas on this subject. Doubtless some of the deep-level mines, more especially the developing ones, today seem to be overcapitalized, but they did not so appear at the time of their flotation, else the working capital would never have been so cheerfully guaranteed at a high premium. Moreover, it is far from certain that they will be so regarded a few years from now, when further development and improved economic conditions bring their welcome changes.

About five years ago I examined a developing deep-level mine that showed only 40 per cent. of 500,000 tons of ore in sight to be payable. Today this property is making profits of £60,000 per annum and steadily improving, while it is unquestionably crushing much of the ore that five years ago was unpayable.

Working Costs

As a mining camp grows older the working costs almost invariably decrease, providing the camp maintains a healthful activity with advancing years, and this has been the case on the Witwatersrand, the result being as follows:

1898, average working costs of 65 companies	25s. 1.3d.
1899, average working costs of 42[1] companies	25s. 2.7d.
1906, average working costs of 58 companies	22s. 1.0d.
1907, average working costs of 56[2] companies	20s. 8.0d.

These costs include mining, development, crushing and sorting, milling, cyaniding, maintenance and general expenses, but they do not cover depreciation and amortization, these items being more properly dealt with by the directors at the end of the year. These results show the very material decrease of 4s. 6d. per ton since 1899, and are therefore approaching now to the 6s. reduction predicted by John Hays Hammond in 1901, but it has taken time to attain this result, as I then pointed out it would do. A comparison of the costs in 1907 with those of 1906 shows a decrease of 1s. 5d., or 34c. per ton, due chiefly to decreased wages and increased efficiency of both white and colored labor, including the Chinese in the latter category, though increased crushing capacity through the use of heavier stamps (up to 1670 lb. per stamp) and regrinding in tube-mills have also aided.

In 1906, 58 companies mined and milled 13,065,624 tons of ore at a total cost of £14,411,219, while in 1907, 56 companies mined and milled 14,861,234 tons at a total cost of £15,351,749, being an increase of 1,795,610 tons for an increased cost of only £940,530.

Most of these economies were attained during the latter half of 1907, after the white-miners' strike, and some mines made startling reductions, as, for instance, the Robinson, which reported costs of 14s. 9d. for November, and the Glencairn, of 15s. 1d. per ton.

Such strenuous and successful efforts are now being made to reduce still more the working costs on the Rand, that I think it safe to anticipate another large decrease for the year 1908.

Output and Dividends

The total output of the Witwatersrand district for 1907 was 6,220,227 oz. (213.27 tons) of fine gold, equal to an average of 17.75 tons of gold per month. The present yield exceeds 19 tons of gold per month. The value of the output is approximately £26,436,000 ($128,572,000), an average of $10,714,300 per month for the year. This amount does not include the "outside" districts of the Transvaal, which are producing in addition about 20,000 oz. of gold per month.

The returns available to date from 56 companies show a total yield during 1907 of £25,154,591, which is equal to 33s. 10.2d. per ton, and a total profit of £9,805,906, equal to 13s. 2.3d. per ton.

The yield per ton for the entire district is practically 34s., or $8.25, which is about 6s., or about $1.50, less than the average return of 10 years ago. On the other hand, working costs have been reduced 4s. 6d., and are still decreasing, while nearly three times the amount of ore is being crushed as in 1897, although the number of producing companies has not been increased 25 per cent. The number of stamps, however, has been more than doubled, 3567 stamps in 1897 and 8375 stamps in November, 1907. Small companies have dropped out and larger ones, both outcrop and deep-level, have taken their places, while many outcrop companies have greatly increased their crushing capacity.

The dividends for 1907, declared up to January 1, 1908, amount to £6,937,187, or £1,202,026 in excess of the dividends for 1906, and these amounts are exclusive of the 10-per cent. profit-tax, from which the Transvaal government should derive an income for 1907 of about £760,000. These dividends represent slightly more than 25 per cent. of the gross output of gold from this district for the past year, certainly an excellent record for any mining district.

Hatch and Leggett in the paper, "An Estimate of the Gold Production and Life of the Main Reef Series, Witwatersrand, down to 6000 ft.,"† predicted an ultimate annual yield of £30,000,000. The yield is now within 12 per cent. of that estimate, which it bids fair soon to reach.

The output for the entire Transvaal for 1907 was £27,403,738, an increase of £2,823,741 as compared with 1906; practically all this increase was due to the Rand proper.

Labor

There is one important point that does not seem to be generally understood, i.e., that the introduction of the Chinese into the Transvaal is not on a par with their introduction into Canada, Australia, the United States or any of the countries that object to their presence. In these latter countries the Chinaman comes immediately into competition with white labor, while in the Transvaal he does not, because there already exists there two planes of labor, the white and the black, and the Chinaman has been rigorously confined to the latter.

In any country where white and black

[1]The Boer war broke out in October, hence the records are incomplete.

[2]Two less than in 1906, due to exhaustion of the Bonanza mine and incomplete records from one other mine.

†*Trans.*, Inst. Min. and Met., Vol. XII, p. 44 (1902-3).

labor work side by side, there are always certain things the white laborer considers *infra dig*, and he will always relegate these to the black. The white man is always scrupulously careful to keep the black on the lower level, and not to allow him to rise, since that would mean competition. In the Transvaal the white miner has the overseer's position and the black man does most of the hard work. Engine-drivers and mechanics are white men; in fact, skilled work of all kinds has always been done by the white man, and always will be done by him.

The Chinese have simply supplemented the supply of Kafirs, and have never been in competition with the white labor any more than are the 100,000 or more Kafirs now at work in the mines in such competition. Nobody has ever objected to these Kafirs working with, and under the direction of, the white miners, and as there are 6,000,000 of them south of the Zambesi alone, the country can never be made a "white man's country" in the full sense of that term.

It is evident that the feeling against the Chinese, founded as it is upon a valid and practical cause in other countries, has no such basis in the Transvaal, and is there but an empty sentiment; one, however, that was worked to such an extent in England, where the average man knew nothing of the real conditions and supposed the Chinese would eventually oust the Briton, that the former have to be sent home on the expiration of their contracts. This has been going on for some time, so that out of the 53,000 Chinese in the country at the end of 1906, it is estimated that but comparatively few will remain by the end of this year.

The repatriation of the Chinese is a loss to the mining industry of the Rand, since they are more intelligent than the Kafirs and have become very adept at mining work. Moreover, they are on a three-year contract, while the Kafirs seldom stay for more than six months at a time, though they often return.

The question now is, can all the Chinese be promptly replaced by Kafirs, to whose scarcity after the war the introduction of the coolie is due. On this point divers opinions have been expressed, but thus far they have been so replaced, in the month of November, 1907, no less than 4610 Chinese having been sent away and their places filled by Kafirs. The Transvaal government, acknowledging its responsibility for sending away the Chinese, has put itself on record as desirous of aiding the mining industry in every way in its power to secure Kafirs.

As to white labor, the miners' wages, heretofore excessive, have been reduced, partly due to the necessity of giving work to the hundreds of unemployed in and around Johannesburg, with a resultant benefit to all concerned, since the efficiency of this class of labor has been much improved.

Before the strike the white miners' pay was £1 per fathom stoped, based on the work of the poorest miner, with the result that capable contractors made enormous profits; today contract prices are reduced, and, what is still more essential, are based upon the capacity of the best miners.

Annual and Quarterly Reports

The mining companies on the Witwatersrand publish such full and complete reports of their operations, that they can well serve as models in this respect to the rest of the world. They comprise reports of the board of directors, the consulting engineer and the manager, and give very full and complete tables, showing the technical details, costs, and results of the operations, together with full financial particulars, comprising usually a balance sheet, revenue and expenditure, or profit and loss account, and an appropriation account; but above all, they show the tonnage in sight at the end of the year and its value, and describe the mine development and the appearance of the bottom levels of the mine.

The quarterly reports issued regularly to the shareholders give in the same way the results of the preceding three months' work, yield, costs and profit, together with a short description of the appearance of the mine, latest developments, tonnage of ore in sight, and oftentimes its value.

Many mining companies in London now send monthly postal cards to each stockholder giving the amount of ore treated, the yield, cost and profit for the preceding month, and any important feature of the month's development on the mine.

Outlook

With regard to the outlook for the mining industry, it is several years since I was in Johannesburg, and it is, therefore, appropriate to quote the views of those who have more recently visited these goldfields. W. Fischer Wilkinson says:[2] "There is still a considerable margin between the average working costs and the average recovery (*average recovery*, $8.25, *average costs*, $5 *per ton*—T.H.L.), and a still further lowering of the grade may be expected, carrying with it a corresponding increase in the tonnage available for profitable mining. Low-grade ores of a value of 5 dwt. per ton or so, which were formerly considered worthless or of little value, are now becoming a valuable asset, and the prospective lives of the working mines are constantly having to be lengthened to meet the altered conditions. Undeveloped properties or those partially developed, whose prospects with costs at 30s. per ton or thereabouts were not bright, can look forward to a profitable existence now that costs have been in many cases reduced to 20s. or less. The possibility of working low-grade ores profitably has now been amply demonstrated, and there is no danger of the Transvaal's failing to contribute heavily to the world's supply of gold for many years after the exhaustion of the richer mines of the Central Rand."

Evidence given before the mining commission in Johannesburg during 1907 was to the effect that 39 of the dividend-paying companies had an average life of 12 years and eight months. Since the life of every mine exhausted to date has been greatly underestimated, sometimes by as much as 50 per cent., and since much lower-grade ore will eventually be worked than is at present milled, it is safe to say that the average life of the above 39 properties will be at least 15 to 16 years It would be interesting to have the estimated average life of a greater number of the properties; but as there were 71 mines that dropped stamps in November, 1907, of which about 50 are paying dividends, and as more deep-level mines will soon join the ranks of the producers, it seems reasonable to expect not only a maintenance of the present output for some years, but even an increase up to £30,000,000 per annum for a part of that time.

As regards development in the deep-level mines, upon which so much depends, although high-grade ore, assaying in the ounces, was struck in the Cinderella Deep at a vertical depth of 4000 ft., and while the Knights Central (still developing) has large quantities of 8-dwt. ore at a vertical depth of about 2400 ft., I am informed that other mines show long stretches of 5- and 4-dwt. ore, with only occasional higher-grade reef.

It is, therefore, imperative that working costs should be reduced still further, in the near future, before these deep-level mines reach the producing stage; and in this connection it is interesting to note that Ross Browne, who has recently made a two-year study of the conditions on the Rand, states, as his opinion, that if the white and the Kafir labor were made more efficient, which he believes can be done, and the cost of supplies lessened, working costs could then be reduced to 15s. per ton.

This is a most encouraging statement, coming, as it does, from a specialist in the subject, and made at a time when the working costs were 22s. per ton.

There is no doubt that costs will be reduced below 20s. during the present year, probably to 19s., perhaps even better than this, for higher efficiency of both white and black labor is now the earnest objective of all the mine managements, and when one reflects that these two items comprise about 62 per cent. of the total working costs it is evident what an effect upon these costs the greater efficiency of labor will have. It is also to be noted that as the efficiency of the miner increases, the cost of supplies decreases; he consumes less or makes a given quantity go farther.

[2] Engineering and Mining Journal, Vol. LXXXV, p. 53 (1908).

Improved Milling Practice

Improvements in the metallurgical practice have brought the extraction up until it is now about 95 per cent. of the assay value of the ore, an important matter when one considers that the saving of one grain of gold per ton of ore crushed means, at the present scale of operations on the Rand, an increased yield of $600,000 per annum. Finally, Mr. Wilkinson considers 5-dwt. ore to be now a valuable asset in any Rand mine—all of which goes to show how time is working in favor of all the mines on the Rand, and especially the deep levels.

In more than one deep-level mine the stopes have turned out better than the assay plans have indicated, and when one reflects that the drives are now from 200 to 300 ft. apart (even 400 ft. in some deep-level mines), and the connecting winzes separated by distances of 400 ft. and more, it is evident how this may happen. Again, later development has shown that poor zones occur in more or less horizontal stretches, so that the bottom levels of a mine may all be in poor ore at the same time, but on pushing down through this zone the development has again disclosed the normal grade of reef.

Hence, it is now thoroughly well recognized on the Rand that deep-level mines must have from 5 to 10 miles of intelligently directed development work on the reefs themselves before a valid opinion can be formed of the value.

To summarize, we find that the Witwatersrand output has increased about £2,800,000 in 1907 as compared with 1906, while the dividends have increased £1,200,000, and working costs have decreased 1s. 5d. for the same period, with another heavy reduction practically assured during the present year.

The use of tube mills and of heavier stamps has increased the stamp duty about one ton, while it is now 5.8 tons per stamp, while the extraction has been increased to about 95 per cent.; hence, tailings that a few years ago ran about 1 dwt., or $1 per ton, now assay but half that amount, with the result that lower-grade ore can now be worked than ever before; in fact, one mine is actually in operation at present on a yield of only $4.31 per ton, or, say, 4.5-dwt. ore.

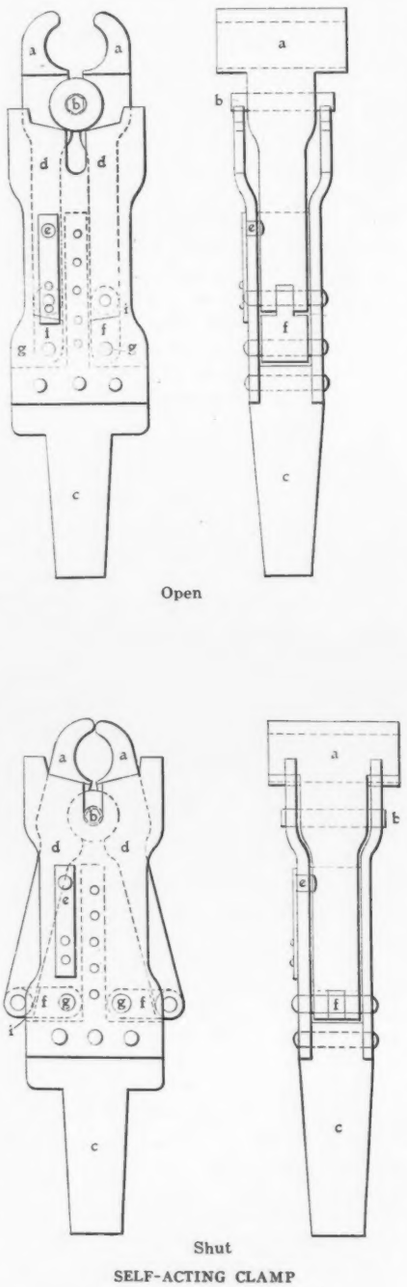
The possibility of a shortage of Kafir labor by next July or August is to be considered, but this may easily prove to be not as serious as some now consider it.

The Rand has been going through very depressing times, the natural reaction from over-speculation, with the result that everything is viewed there today "as through a glass, darkly." But the hard times have had a very salutary effect; efforts are being concentrated along the proper lines to secure economy in all branches of its great gold-mining industry, and the results of these are bound to tell favorably in the near future.

Self-acting Cable Clamp

An automatic cable clamp, applicable wherever an overhead endless-rope haulage system is employed, for the purpose of attaching a car or a trip of cars to the moving cable, is described in *Glückauf*, May 2, 1908.

It consists of three principal parts: A strong, wrought-iron T *c*, the lower end of which is tapered for the purpose of inserting it into a socket on the car; a pair of wrought-iron plates, and a pair of malleable cast-iron jaws to clamp the rope. The jaws are in the form of pinchers; they are joined at *b* by a pin which passes through the outer plates. The lower ends of the jaws play in the space between the plates, and each is jointed to one end of a link *f*, the other end of which is hinged on the pin *g* which passes through the outside plates.



SELF-ACTING CLAMP

To put the apparatus into use, the wedge *c* is inserted into its socket on the car and the jaws *a* are separated, as in the upper figure. A little dowel *e*, which is fastened to the loose end of a flat steel spring, projects through one of the outside plates and engages a shallow depression in one of the cast-iron jaws; this holds the jaws in an open position. The rope is now dropped into the space between the jaws and its weight is sufficient to depress them, the links *f* throwing the lower ends of the jaws outward into the position shown in the lower figure. The accidental loosening of the rope on curves, or by vibration of the rope is found to be impossible from the experience at the Osterfeld mine. The rope can easily be liberated by lifting upward on it, which can be done automatically at any desired point by carrying the cable upward over a pulley.

Tunisian Phosphates

According to *Revista Minera*, the Sociedad de Gafsa completed in 1907 its branch railroad from Metlaui to Redeyef, and began at once to ship from the latter place 63 to 68 per cent. phosphate at the rate of 500 tons per day. That company is expected to ship, during 1908, around 900,000 tons as against 746,700 tons which were shipped from Metlaui in 1907. Other excellent deposits at Ain Mulares are being developed in readiness for the completion of the railroad to Susa. Within a few years Gafsa should be able to ship 1,500,000 tons of phosphate, most of which will contain 63 to 68 per cent. bone phosphate.

The Kalaa Djerda mine, belonging to the Société Tunisienne des Phosphates, in 1907 shipped 185,917 tons averaging 60 to 65 per cent.; in the present year that concern should ship 225,000 tons, and keep it up for a number of years.

The Kalaat-es-Senam mine, owned by the Société du Dyr, shipped 108,158 tons in 1907, and this output will undoubtedly increase to 140,000 tons as soon as the new developments at Kef Rebiba go into operation. The rock at this place averages 58 to 63 per cent. as compared with 53 to 56 per cent. at Kalaat.

Asbestos is found in Cape Colony in South Africa. The deposits known are in Griqualand West and near the Orange river. Exports of asbestos from Cape Colony were valued at £9836 in 1906, and at £7910 last year.

Colombia is rich in mineral wealth, but lack of transportation, and the poor climatic and political conditions present serious drawbacks to the mining industry.

Gypsum Deposits of Montana

By J. P. Rowe*

Montana has as large deposits of gypsum as any State in the Union. The economic deposits may be divided into three general fields: the north, middle, and south fields. These fields follow the contour of the mountains and run from northwest to southeast through the State. Little is known of the middle field, but it is claimed that some good deposits are found near Limespur, Jefferson county.

The north field is situated in the counties of Cascade and Fergus. Two large deposits are found in this field: one near the towns of Armington and Kibby in Cascade county; and the other in the Big Snowy mountains, of Fergus county, near Portuguese. The south field is situated in Carbon county, near Bridger.

The selenite variety of gypsum is found in all the counties of Montana east of the Rockies. It occurs in the upper Cretaceous formations, but is seldom found in commercial quantities.

The principal beds in the north field now worked are situated in the northwestern part of Cascade county, and cover rather a large area. According to Weed, "The series of beds may be traced from the Missouri river eastward along the flanks of the Big Belt mountains to Riceville on the Neihart branch of the Great Northern railway, thence eastward to the town of Kibby and thence around the flank of the Little Belt mountains in a nearly continuous exposure to the vicinity of Castle mountains. Southward from that locality the same horizon can be traced by its red shales, but gypsum does not occur, so far as known, in sufficient purity or thickness to promise commercial importance."

The beds nine miles northwest of Kibby and six miles above Armington were opened in 1900 and a plant for the manufacture of stucco and plaster of paris was installed. The mill is on the Neihart branch of the Montana Central railway six miles above Armington on Belt creek and 34 miles from Great Falls. The mine is directly behind the mill and sufficiently high on the hillsid to facilitate handling the rock.

Operations at Armington

The gypsum is damped into a bin and is passed through a 12x24-in. Blake crusher which crushes it to about 1 in.; then through a Gates crusher, which reduces it to ¼-in.; then it is elevated to a trommel which separates the coarse from the fine, all over 40 mesh going down through a gravity pipe to a French bur mill which reduces everything to 40 mesh or finer; from the bur mill it is again elevated to the same separator, whence it travels by gravity to a bin over the calciner. The calciner holds about three tons; the gypsum is subjected to a heat usually of 260 deg. F. for 2½ hours. From here the plaster of paris is conveyed to a storage bin where a retarder and hair are added, then through a Broughton mixer which finishes the stucco. The capacity of the mill is 30 tons per day of 24 hours.

The beds found here are between 25 and 30 ft. thick and extend over a large area. They are nearly horizontal, having a slight dip to the northwest. The gypsum itself is fairly pure but is interstratified somewhat, in places, with considerable clay. The gypsum is not more than 100 to 200 ft. below the surface and rests upon a hard compact limestone. From the dip, geological formation, and other indications it appears that the beds are probably the same as at Kibby, nine miles away. The other bed that belongs to this field is situated in the Big Snowy mountains, near Portuguese, about 35 miles south of Lewiston, Fergus county. The material is an excellent quality of alabaster.

The middle field lies about two miles east of Limespur, a flag station on the main line of the Northern Pacific railroad. It is not well known, nor has it been much prospected. The geological formation is similar to that of the south field.

The productive part of the south field lies wholly within Carbon county and the series of beds extend southward into the Big Horn basin and can be traced into the mountains of Wyoming. There are three good outcrops in this field. At present only one of the three is being worked. The smallest or first outcrop is situated about eight miles south and east of Bridger and at this outcrop is located the second of the two gypsum plants in the State. The mill is smaller, but similar to the one near Armington. From 10 to 15 men are employed at the mill and in the mines, and the products, plaster of paris and stucco, are hauled to Bridger whence they are shipped by rail to various points in the State. The deposit is from 10 to 12 ft. thick and is fairly pure gypsum. The beds dip considerably to the northeast and form part of an anticline. This sypsum deposit has been worked for some time in spite of a long distance from the railway and the high price of teaming.

The second outcrop is between eight and ten miles from the first, and while it has never been developed to any great extent, it has been worked enough to show that it is much thicker and as free from interstratified clay as the first deposit.

The third and largest bed of this field and the thickest is situated about 16 miles south and east of Bridger, and about six miles northeast of the first outcrop, and four or five miles north of the second outcrop. At the southern outcrop its thickness is about 20 ft. and it gradually grows thicker to the northward until it reaches a maximum thickness of 50 ft. The maximum thickness continues for some distance when a gradual thinning out begins until about three miles north of the first outcrop, where the thickness is about 15 ft. The deposit takes a north and south strike and dips a few degrees to the southwest. The sypsum outcrops which cap the Red Beds may be traced for at least 15 miles.

GYPSUM MILL, NEAR ARMINGTON, MONT.

GYPSUM DEPOSIT NEAR LIMESPUR, MONT.

*University of Montana, Missoula, Mont.

Alaska United Gold Mining Company

The report of the Alaska United Gold Mining Company is for the year ended Dec. 31, 1907. Like all the reports issued by this group of Alaska mines this one contains complete details of operation and costs which have been here greatly condensed.

Ready Bullion Mine

The development during 1907 was less than in 1906. The total amount of openings made from 1899 to 1907 inclusive amounts to 27,362 ft. The following shows the development work in 1907, that done in 1906 being in parenthesis: Drifts, 301 ft. (1225 ft.); intermediate drifts, 540 (793); crosscuts, 502 (14); raises, 458 (1171); shaft sinking, 10 (135); stations and skip chutes, 561 (89); total 2372 ft. (3427 ft.) These totals compare with 3815 ft. in 1905.

The amount of ore mined, hoisted, crushed and placed in the mill bins was 213,370 short tons of which 74.63 per cent. came from the stopes at the 1200- and 1350-ft. levels. Development work at the 1350-ft. level produced 15,991 tons or 7.5 per cent. of the total. The ore reserves at this mine are estimated to be 1,378,651 short tons which includes pillars below the 900-ft. level but not the ore in the shaft, stope and sea-pillars above the 900. There were 195,396 ft. of holes drilled in 1907 by which were broken 224,866 tons of ore and waste, an average of 1.15 tons per foot.

The average assay of 1820 samples showed the following values per ton: 213 samples from 750-ft. level, $1.40; 2 from 900-ft., $0.64; 125 from 1025-ft., $1.75; 709 from 1200-ft., $2.35; 663 from 1350-ft., $2.08; 108 from 1500-ft., $3.79; total, 1820 averaging $2.14 per ton.

Financial Statement.

	Total.	Per Ton Milled.
Receipts:		
From bullion	$219,054	$1.0266
From base bars	5,096	0.0239
From sulphurets	136,201	0.6384
From interest	900	0.0042
Rental and profit from 700-Foot claim	59,246	0.2777
Total	$420,497	$1.9706
Disbursements:		
Mining and development	$213,235	$0.9994
Mining, 700-Foot claim	75,538	0.3540
Milling	76,198	0.3571
Sulphuret expense	22,703	0.1064
General expense	5,894	0.0276
Construction and repairs	2,661	0.0125
All other expenses	9,399	0.0441
Total	$405,628	$1.9011
Net operating profit	$14,869	$0.0697

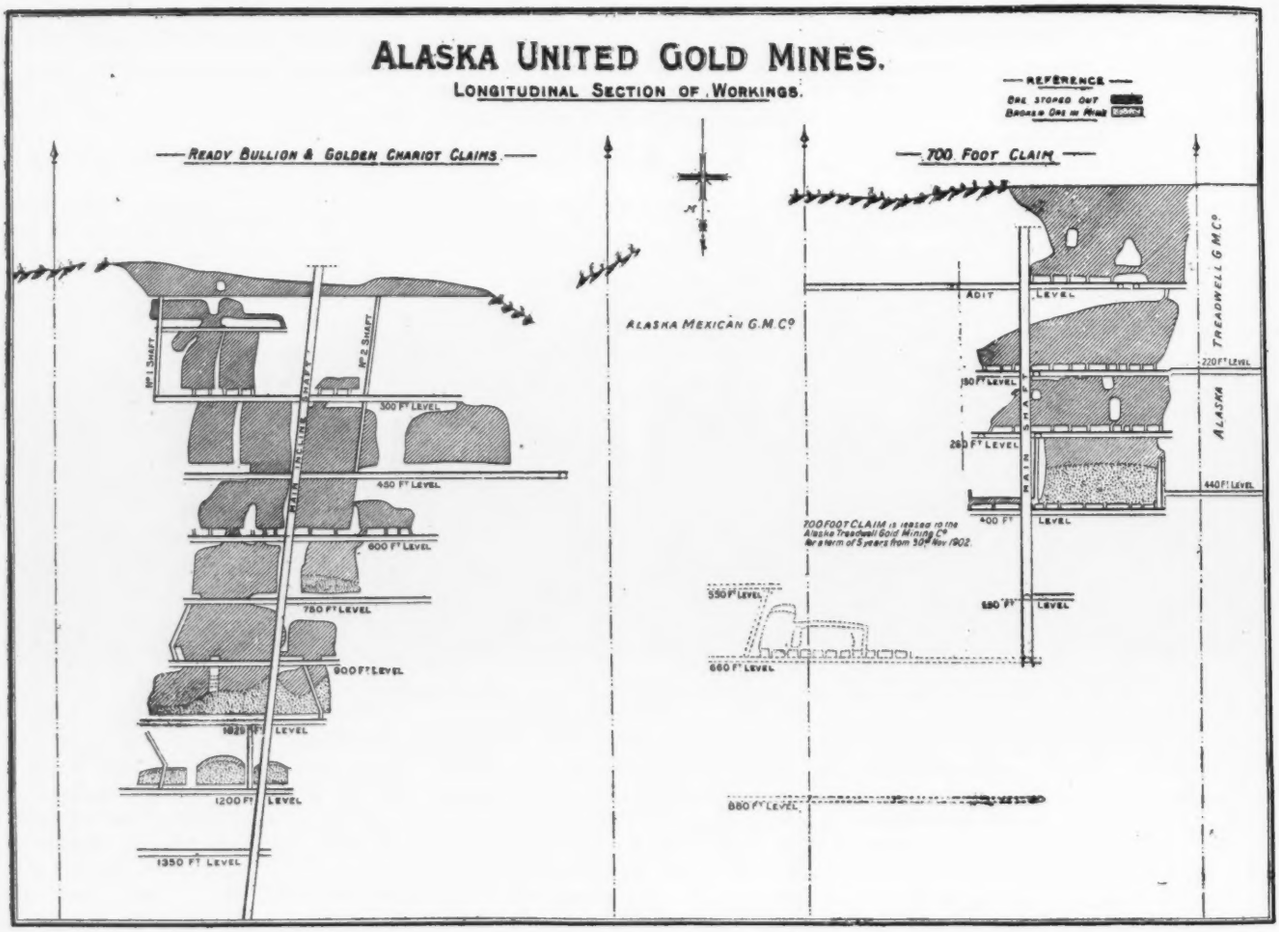
The 700-foot Mine

The development in 1907 was as follows, the figures for 1906 being shown in parenthesis: Drifts, 959 ft. (1274 ft.); intermediate drifts, 431 (921); crosscuts, 83 (216); raises, 771 (563); shaft sinking, *nil*, (182); total 2424 ft. (3156 ft.) The total development to date amounts to 16,434 ft. There is estimated to be 355,082 tons of ore in sight below the 550-ft. level. There were 57,276 tons of ore, averaging $2.46 per ton, sent to the mill. The average assay value of 526 samples from the 700-Foot mine was $2.46 per ton.

The Alaska United Mill

The 120-stamp mill of the Alaska United company crushed 213,370 tons of ore at a cost of $0.3571 per ton. The ore yielded $224,150 in free gold including copper and base bars and $136,201 from sulphurets treated. The yield was, therefore, $1.6889 per ton. The mill operated with steam power 220 days and with water power 89 days a total of 309 days. The average duty per stamp was 5.75 tons per 24 hours. The consumption of quicksilver was 37,995 oz. of which the batteries took 27,754 oz.; plates, 1994; vanners, 849; miscellaneous, 7398. The amount of quicksilver fed per ton of ore was: batteries, 0.1301 oz.; plates, 0.0093 oz.; vanners, 0.004 oz.; cleaning amalgam, 0.0346 oz.; total, 0.1780 oz. The gross value per ton of ore crushed was $1.8352 and the value of the tailings was $0.1875. The extraction was, therefore, 89.78 per cent.

In 1907 the average number of men employed by the Alaska United company was 154 and the average wage received was $3.29 per day.



The Mackay Mining Building, University of Nevada

The Mackay school of mines building, at Reno, was presented to the University of Nevada, on June 10, by Mr. and Mrs. Clarence H. Mackay, in honor of the memory of John William Mackay. At the same time a bronze statue of John W. Mackay was presented to the State of Nevada by Mr. and Mrs. Mackay. This statue faces the south, looking toward Virginia City, and is placed in front of the mining building.

The building houses the departments of mining and geology and at the time of its dedication was completely equipped. In general plan the building is U-shaped, the lower part of the U having two stories and the wings a single story each. One wing is devoted to the mining and geological museum, the other to the assay and metallurgical laboratories. The lower floor of the main building provides for chemical and petrographical laboratories, a class room and offices; the upper floor contains the mineralogical laboratory, rock-grinding rooms, mining class room and offices. Between the wings is a library room.

MACKAY MINING BUILDING, UNIVERSITY OF NEVADA, RENO, NEVADA

Equipment of the Laboratories

The chemical laboratory is divided into two parts: the working laboratory proper which is equipped with the usual desks, sinks, hoods, hot-plates and air baths; and the weighing room, which is equipped with two analytical balances, pulp balances, and chemical lockers. The assay laboratory comprises the furnace and pulp room, parting, weighing, and store rooms. The furnace room is equipped with three double-muffle furnaces, burning soft coal, four oil-fired crucible furnaces, four oil-fired muffle, one coke melting and two coke muffle furnaces. The parting room is equipped with gas-heated hot-plates, cement tables, hood, and bullion rolls. The weighing room contains four Becker bead balances, an Ainsworth, an Oertling, and a Keller balance.

The metallurgical equipment includes the following machinery, all of commercial size: A three-stamp battery and feeder; amalgamation plates on steel table; a 4-ft. Union concentrator, a Wilfley concentrating table, a two-compartment jig, classifiers and sizing cones; a 4x8-in. rock-breaker of the Sturtevant type, 10x 14-in. crushing roll; a 2x6-in. Columbian separator; an automatic sampler; belt elevator; a cyanide plant of one-ton capacity; a 3x8-in. roasting furnace; an 18-in. amalgamation pan; a sample crusher; and sample grinder.

The mining-machinery equipment consists of an Ingersoll-Sergeant drill and air compressor with a complete tool-sharpening kit and set of drills.

The laboratory is so arranged as to admit of the following being carried out on a working scale: Dry crushing and automatic sampling of an ore to any mesh coarser than a 40 screen; coarse and fine concentration of an ore after crushing with either stamp battery or rolls; wet crushing; plate amalgamation and concentration of gold ores; cyanide treatment of either gold or silver ores after stamping or from the rolls, the roasting furnace enabling ores to be given a chloridizing or an oxidizing roasting before treatment in the vats, and, finally, pan amalgamation of silver ores. All the machines are so arranged as to admit of independent working or working in conjunction. A 15- and a 5-h.p. induction motor drive all the machinery.

The department of geology is provided with laboratories with reference collections illustrating the minerals, rocks and fossils, and class collections for study and determination. The petrographical laboratory is equipped with apparatus for making thin sections, and with petrographical microscopes and the necessary accessories; it has also a set of mineral thin sections cut in definite directions, and a collection of rock sections with many representatives of each of the chief types, together with many sections illustrating special types. Blowpipe and other chemical work is also provided for.

A remarkable performance in mining work is recorded in the *South African Mining Journal* of May 9, 1908. At the Simmer Deep, a Rand property, two miners carried a drive 294 ft. in 61 consecutive shifts of 10 hours each. The size of the drive was 5x7 ft. One white man and six Chinese were employed on each shift, and one round was drilled per shift, each round gaining an average of 4.82 ft. The number of feet broken per case of gelatin consumed was 4.52, and 11.06 lb. of gelatin were used per foot. Of the 61 rounds drilled, 59 had 14 holes each and two had 12 holes each. The nature of the ground driven through is not mentioned.

The Mineral Industry of Quebec

SPECIAL CORRESPONDENCE

According to the summary statement[1] of the mineral productions of the Province of Quebec, the total value of the output last year was $5,391,368. This represents the value of the merchantable product at the mine or the nearest shipping point, either in the raw state or after a first preparation to make it suitable for use or sale. The metallic production was small, the only products of this character returned being bog-ore iron, 22,681 tons, value $80,231; chrome iron, 6407 tons, value, $63,130; copper ore 29,574 tons, value $160,455. The most important item on the list is asbestos, which was produced to the amount of 61,985 tons, of the value of $2,455,919. The yield of trimmed mica was 550,247 lb., value $199,848, and of crude mica 150 tons were produced, worth $24,030. The building materials which constituted most of the remaining items, include cement to the value of $640,000, the quantity not specified.

The manufacture of charcoal pig iron was carried on by the Canada Iron Furnace Company at Radnor, and John McDougall & Co., Drummondville, bog-iron ore being principally used; the output amounted to 10,047 tons.

IRON ORES

An examination of iron deposits in Dunham township, Missisquoi county, was made, where a strip of ferruginous dolomite occurs for a distance of about 8 miles. This is sometimes strongly mineralized, presenting irregularly distributed masses of hematite, occasionally taking the form of veins up to 2 ft. in thickness. An analysis showed: Metallic iron 69.49; silica 1.32; sulphur 0.10; and phosphorus 0.08. Mr. Obalski is of the opinion that prospecting might lead to the discovery of more important masses suitable for working.

Experiments for the industrial treatment of the magnetic sands of the north shore of the St. Lawrence are in progress, showing that the sands can be concentrated into a product yielding from 67 to 70 per cent. metallic iron, about 1 per cent. titanium, and practically no sulphur or phosphorus. As regards the smelting of the ore, certain inventors claim that it can be treated directly by the electric furnace, while others are content with its agglomeration to use as ordinary ore. The magnetic sands have been treated by the Gröndal process, and concentration was satisfactory, but owing to the polished and worn condition of the sand preventing a good agglomeration, the concentrates were crushed and briquets obtained, which became well agglomerated, yielding a product comparable to that obtained from other ores. It is, therefore, hoped that the magnetic sands will be worked industrially in the near future.

COPPER

The copper-mining industry was unsettled, owing to unfavorable market conditions, but the mines of the Capelton region were regularly worked by the Nichols Chemical Company and the Eustis Mining Company. The workings of the Eustis have reached a depth of 2800 ft. Concentration works have been installed to treat the tailings of the mine with a capacity of 200 tons of concentrates per 24 hours. At the King mine, controlled by A. O. Norton, about 1000 tons had been extracted and development was actively carried on.

GOLD

The report notes the conditions under which alluvial gold has been found in the River Gilbert district, Beauce county, where since 1878 workings have been carried on in irregular fashion and on a small scale. It is estimated that altogether $2,000,000 worth of gold has been taken out of the River Gilbert valley within a distance of 2 miles. It is suggested that examination should be made of points that have been overlooked, on the hypothesis that the gold is not irregularly distributed in a few localities, but that its distribution must have followed natural laws, and that the line of deposit may connect the points where gold is known to occur. Numerous quartz veins containing gold have been discovered, but so far gold in commercial quantities has not been obtained. In Marston township a deposit of auriferous quartz occurs and a local syndicate has been found to operate it. This is referred to as the first instance of the finding of gold in the quartz in the Chaudiere valley in apparently commercial quantity, though the actual test as to this has yet to be made.

ASBESTOS

In the asbestos industry, the utilization of short fibers in the manufacture of boards has stimulated the opening of new mines. The East Broughton mines, which produce no long fiber, have consequently acquired some importance and new companies have been organized. Most of the companies use electric power furnished by the Shawinigan Water Power Company and the St. Francis Power Company.

THE NORTH COUNTRY

The concluding portion of the report deals with explorations north of Pontiac, the most important feature being Mr. Obalski's investigations in the Lake Opasatica gold region. He refers to R. W. Brock's report on Larder lake, where the formation of that district is described as a ferruginous dolomite mixed with quartz and green schistose rock, probably of a serpentine nature, which, especially when intersected by porphyritic dikes of pegmatite, is traversed by numerous threads or small veins of quartz, which are sometimes auriferous. Mr. Obalski calls attention to the fact that this formation continues toward the northeast in the Province of Quebec, and is similar to that found to the north of Lake Opasatica, in which gold has been discovered. At the property of the Compagnie des Mines d'Or de Pontiac & Abitibi, about 2½ miles from the head of Lake Opasatica, numerous veins of quartz from a few inches to several feet in width had been discovered, on which shafts from 15 to 20 ft. deep have been sunk. By washing the earth and débris around several of these veins fine colors of gold were obtained. The general formation of this region is a greenish dioritic schist, fairly compact and quartzose, traversed by veins and veinlets of quartz, which do not seem to have any special direction. South of Lake Ollier is a considerable development of very hard, reddish porphyritic rock. North of this property is a concession of 200 acres, belonging to the King of the North company, which has made some excavations and put up a small camp.

"To sum up," continues Mr. Obalski, "my opinion on this district is the same as that expressed in my report of last year. There is a mass there that I called conglomerate, but which Mr. Brock calls silicified dolomite, mixed with schistose serpentine, and which is in contact with a schistose diorite, also traversed by quartzose veins, in some of which a little gold has been found. This region is traversed by eruptive masses containing the elements of granite, but which I called porphyry because of the compact state of the feldspar. I am not yet in a position to express an opinion as to the future of this district, before more extensive work has been done and assays made in the mills; but the prospects already made on the land held by the Pontiac & Abitibi company would justify a certain amount of expenditure for that object."

Taking the lead ore (concentrate) as yielding an average of 60 per cent. in pig lead, the four principal companies of southeastern Missouri produced up to the end of 1903 about 405,000 tons of pig lead, and allowing for the output of the Mine la Motte and three companies at Flat River which recently became productive, it is safe to say that the lead output of the disseminated district of southeastern Missouri has been nearly twice as great as that of Eureka, Nev., which was discovered about the same time. It has been exceeded only by the output of Leadville, the Cœur d'Alene and Wisconsin, but while Leadville and Wisconsin have risen and waned, southeastern Missouri, like the Cœur d' Alene, has steadily increased.

[1] "Mining Operations in the Province of Quebec for the year 1907." By J. Obalski, superintendent of mines. Pp. 61; illustrated, 6½x9½ in., paper; 1908. Quebec; King's Printer.

Working a Coal Seam of Moderate Thickness

A Method of Extracting Pillars without Causing Crush and Creep. The Haulage System is Flexible, and Little Timber Is Lost

BY GEORGE RAYLTON DIXON

Referring to Fig. 1, it will be seen that after the shaft pillars are formed, winnings are driven, level course, on both sides of the shafts. The roads are shown in the figure by single lines only; in all, five roads are driven. The center place is for a main haulage road, and is made 12 ft. wide. The entries on either side of it are for main return airways, and are 7 or 8 ft. wide. The outer places are driven 12 ft. wide.

nings are turned off the main levels to the full rise, and also to the full dip.

In this case three roads are driven; the center one for a rolleyway, and the other two for airways. The remaining roads are not necessary, for it is evident that the line of face is parallel with the roads, and therefore the face can be stopped when it reaches the previously fixed distance from the air roads. The coal is dropped down the rise rolleyway by a self-acting

are then turned at right angles, to full rise. On this course they are called "barrier places" and they are driven till they hole back to the main levels. An exactly similar operation has taken place to the left of the main dip winnings, as will be seen on referring to Fig. 1.

Extracting the Pillars

When the main level winnings from the shaft have been advanced far enough,

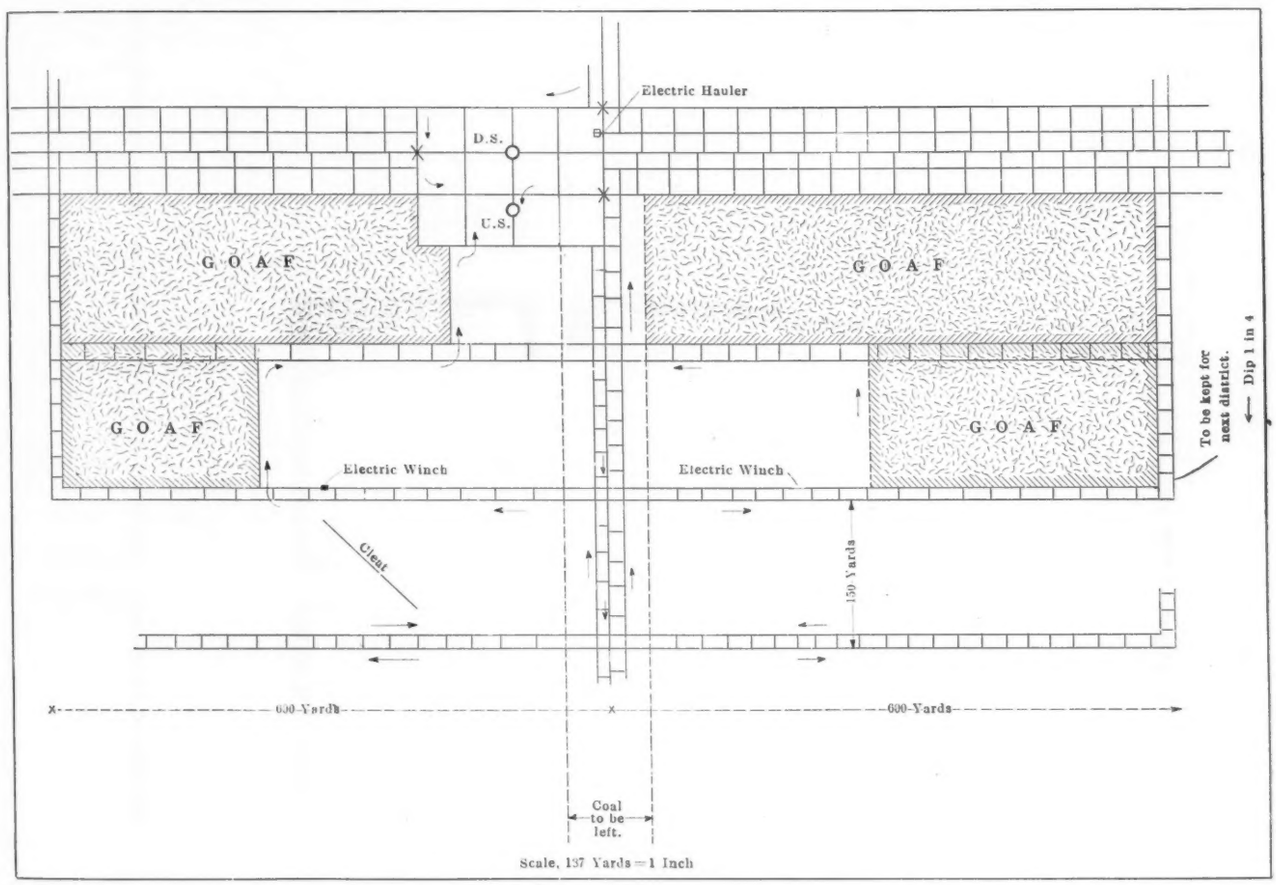


FIG. 1. GENERAL PLAN OF DEVELOPMENT. ROADS ARE SHOWN BY SINGLE LINES ONLY

The distance from the center of a rolleyway to the center of a return airway is 60 ft. The distance from the center of a return to an outer place is 120 ft. These outer places define the lines of the goaf edges; the coal between them serving to support the main rolleyway and return airways. If too little coal is left for this purpose, crush and creep will be brought about, causing constant heavy charges for the upkeep of the roads. The first 300 ft. from the hoisting shaft bottom serves as a siding; at the end of this siding, winincline. It is drawn out of the dip rolleyway by an electric hauling engine placed at the top. Following the dip winnings, it is seen in the figure that when they have advanced to a point 630 ft. from the main level rolleyway, other winnings can be started. From the lowest of the five main level winning places to the highest of the two new winning places is 450 ft. This latter place is driven 12 ft. wide, as a double car track will be laid in it. Its companion place is 7 ft. wide. The two places are advanced for a distance of 1800 ft., and

other dip and rise winnings can be driven, thus cutting up the coal seam into huge pillars, roughly 1800 ft. by 450 ft. When one such pillar has been formed, a commencement is made to work it out. Fig. 1 shows that a considerable area of goaf has been formed. The coursing of the air is shown by arrows. Let us imagine that we are extracting a pillar to the right of the figure. The method of working is plainly shown in Fig. 2.

A commencement is made on a barrier place 12 ft. wide. In the level road be-

low, a double car road is laid except for a distance of the last 100 ft., when they are joined in one. The single track is carried around the right-angle bend and up to the top of the barrier place. It is laid next to the coal, and is spanned by roof supporting bars, carried on props. Near to the points of the double parting stands a portable electric winch. A rope passes from the drum, around a guiding pulley at the bottom of the barrier place, up to the top of that place, around a return wheel and back to the winch. The arrangement is plainly shown in Fig. 2. A set of empty cars is brought forward by a pony into the single track. The rope is attached, the winch put in motion and the set can be stopped at any point on the incline, in obedience to a signal.

The cars are not close coupled but have a long coupling chain, to space them about 4 ft. apart. This is important as it allows the men room to work. Eight or ten men can be placed at such a face. They commence at the top and take a strip of coal off the full length of the pillar, 4 ft. 6 in. wide. It takes several days to do this. As the first lift proceeds, a row of hardwood chocks is built along the side of the car road, so that when it is finished there is a complete row from top to bottom, 10 or 12 ft. apart.

As the lift advances, the car road is taken up and relaid near the coal. When the lift is finished, the turn at the bottom is shifted back nearer to the winch. To do this conveniently, rails of different lengths are kept to be laid just in front of the curve. Thus a length 13½ ft. long will be replaced by one 9 ft. long and this in its turn by one 4½ ft. long. The iron standards carrying the guide wheels at the top and bottom are also made to move forward. Around the curve, as close to the rail as possible, guide rollers are placed to keep the lead of the rope as near in line with the cars as possible, thus avoiding pulling them off the track. These also are, of course, to move forward, so it will be seen that on a lift being completed, there is much work to do, preparatory to a new lift being commenced.

Drawing the Chocks

As the second lift proceeds a second row of chocks is built, and when this lift is finished there is a large area of exposed roof. All the old timber behind the first row of chocks set, (that is, the second from the coal) is now drawn out and there will be a fall of rock. As successive lifts are taken off, new chocks are built in and an old row of chocks drawn out, but there are at all times two rows of chocks between the coal face and the goaf.

The return wheel at the top is moved once during the progress of a lift and that is when it is halfway down. It will be seen on comparing the relative directions of the cleat and the face line that the weight of the overburden will assist the working off of the coal materially. The man farthest up keeps cutting through the cleats on the line representing the back of the lift in progress. All the hewers curve in the softest part of the seam, which is about 2 ft. from the bottom. They do not need to curve far in, as the pressure soon makes it easy to hack the coal off at the cleats. It is seldom that explosives are required. The coal is gotten in large pieces, an important consideration, as it is a steam coal. The description of the pillar working so far applies to a face on the right side of Fig. 1.

Explosives Are Used in Working a Left-hand Face

It will be obvious on referring to the first figure that a left-hand face is not quite so favorably situated. The relative direction of cleat and face is such that the coal is strong to resist pressure from above. Explosives have therefore to be used to a greater extent on such a face. The points joining the double parting to the single way and the portable winch have to be moved back periodically. The place farthest down is kept good by the strip of coal between the two places and becomes the air road for the next face below. The chocks on the face are built up with pieces of oak 22x5x5 in. The timber bars are soft Norway wood 6 ft. by 7 in. by 3½ in. The props are 6 in. in diameter and 5 ft. 6 in. long. The car track is in 15 ft. lengths of flat bot-

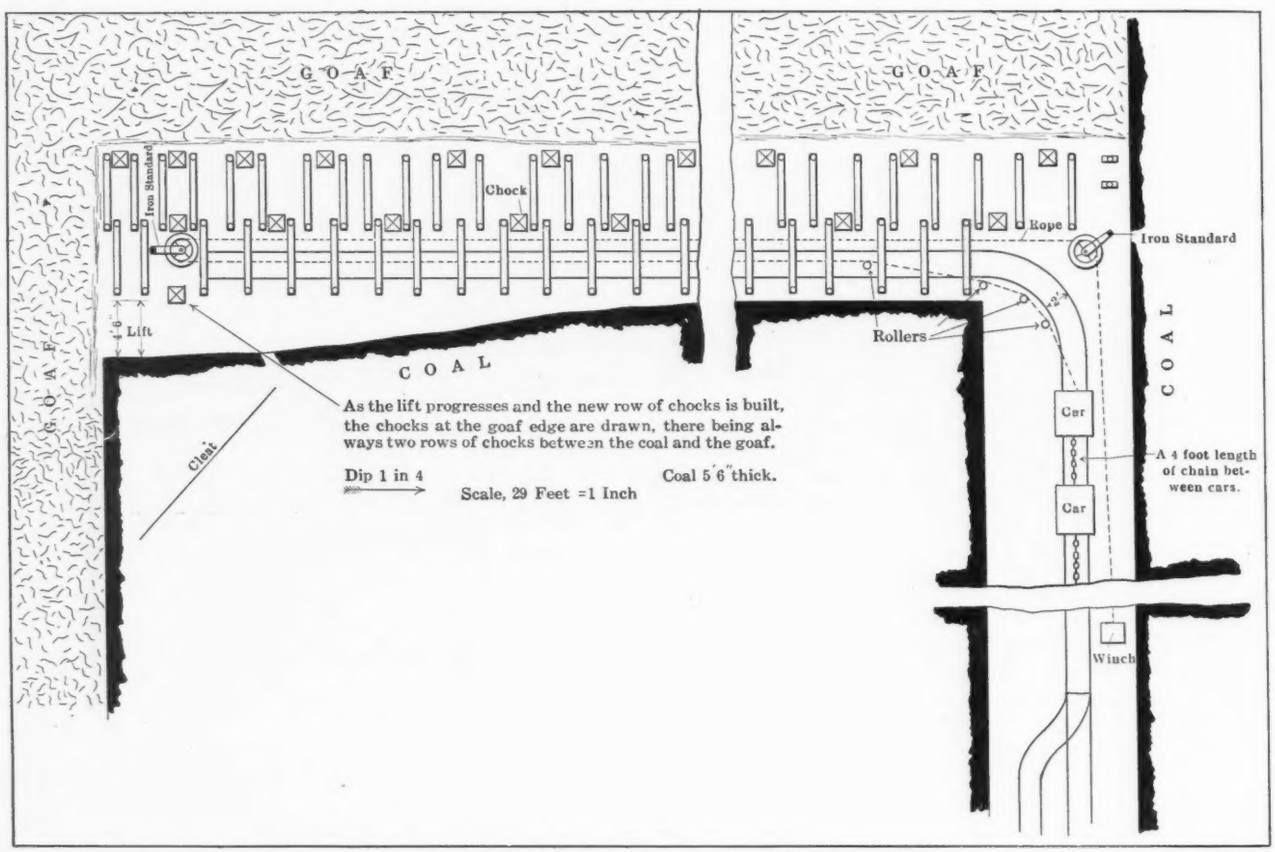

G O A F
G O A F
Iron Standard
Chock
Rope
Iron Standard
Lift
Rollers
C O A L
C O A L
As the lift progresses and the new row of chocks is built, the chocks at the goaf edge are drawn, there being always two rows of chocks between the coal and the goaf.
Cleat
Dip 1 in 4
Coal 5 6" thick.
Scale, 29 Feet =1 Inch
Car
Car
A 4 foot length of chain between cars.
Winch

FIG. 2. GENERAL METHOD OF EXTRACTING THE PILLARS

tomed rails weighing 15 lb. per yard. They are spiked to sleepers 3 ft. by 5 in. by 2½ in. When the track is moved forward the fished joints are broken, and still attached to the sleepers, are passed through between the props. The cars carry 9 cwt. of coal and weight 4½ cwt. The timbering of the 12 ft. wide level road is not shown in Fig. 2. The timber bars are 12 ft. by 12 in. by 6 in., set with the flat side against the roof. The props are 6 in. in diameter. The heavy bars and supporting props are pickled in saturated salt brine to prevent decay.

The movable standards for guide pulleys are of 3-in. square iron in two sections. Holes are cut in the top and bottom. The square iron is inserted and the two parts clamped together. This is found to be much better than sliding telescopic standards. This method of working suits the conditions it is applied to, most admirably. I have only seen it at one colliery and hope this account may be of interest and use to readers of the JOURNAL.

Group Electric Shot Firing

BY SYDNEY F. WALKER*

As mentioned in the "colliery notes" in the JOURNAL of Feb. 29, group shot firing with electrical fuses is somewhat uncertain, and as explained in those notes, the uncertainty is due to differences in the fuses themselves, and in the action of the current when passing through them. There are two forms of fuses, and in both, the fuse cap contains a small quantity of a detonating substance, fulminate of mercury, or some similar ingredient. In one form, fine platinum wire is embedded in the detonating matter, and in the other, two small copper wires, whose ends are separated by a small space, are also embedded in it. With the platinum wire form, which is known as the low-tension type, the necessary heat to produce detonation is produced by a current of electricity passing through the wire, and heating it to redness. With the other form the heat is produced by a spark passing between the ends of the two copper wires, this form being known as the high-tension fuse. The low-tension fuse requires a comparatively large current; according to some measurements I made sometime ago, about 0.3 amp. per fuse, but the pressure required is small, only a few volts. The high-tension fuse requires but a small current, in fact I do not know of its having been actually measured, for it would be difficult to do so as it possesses the oscillating properties of the spark, but requires a comparatively high tension. Much of the trouble with fuses that occurred some years ago, was due to the fact that the high-tension fuses were not made to gage. The tension required to throw a spark across the gap between the wires, is as a rule fairly high, but it will necessarily vary with the distance between the ends, and it may also vary with the nature of the substance in which the wires are embedded, and with the manner in which the substance is packed. In the tests which I made some years ago, it was found that occasionally a fuse could be exploded with as low a pressure as two volts, while on the other hand, some require as much as 100 volts to explode them. Modern fuses have followed the course of the general improvement in engineering work, and are now made more nearly alike, and therefore, there is considerably less difference between the individual high-tension fuses than formerly.

THE NECESSITY OF CONSIDERING ALL DETAILS

A little consideration, however, will show how small differences, either in the lengths of the platinum wires of the low-tension fuses, or in the gage of the wire, or in its attachment to the ends of the copper leading wires, will cause a considerable difference between the circuits that are open to the current; similarly, small differences in the distances between the wires of the high-tension fuses, and between the packing of the detonating substance, will also lead to considerable differences in the paths offered by them. If fuses are arranged in series, the danger is, with the low-tension fuses, that one of them will go before the others have had time to receive sufficient current to cause detonation, and then the fuses which have not ignited their charges, cannot do so. With fuses connected in parallel, that is to say, where the current from the exploder divides between the different fuses of the group, the same difficulty may arise in another form. If one of the fuses is of a much lower resistance than the others, it may take so much current from the firing battery, that the pressure of the current delivered to the others is not sufficient to drive the necessary heating current through them, and hence they cannot ignite their charges. With the high-tension fuses, when connected in series, there is not the danger of the circuit being broken by one fuse going before the others explode, unless the explosion also breaks the connecting wires, which is possible. The danger in this case is, that one or more of the fuses may be of such resistance that a large portion of the pressure is absorbed, and only one or two of the group may be able to have a sufficient pressure to throw the necessary sparks across. When high-tension fuses are arranged in parallel, there is not this danger, but there is still the possibility that some of the fuses may be of too high a resistance to allow a spark to pass, and therefore cannot fire.

The trouble is often accentuated, as is stated in the "colliery notes," by the magnetism of the firing battery having been reduced. This is one of the troubles encountered in the construction of the magneto-electric machines, that are now so universally employed for firing batteries; but on the other hand, the improvements which have taken place in the manufacture of special magnet steel, should have practically neutralized this difficulty. Within the last 10 or 15 years, the demand for a steel that will accept a large amount of magnetism, and what is more important, that will hold it at practically the same limit of saturation, for electrical measuring instruments, has been followed by the usual result, and manufacturers are now able to produce a thoroughly satisfactory steel for the purpose. Steel made for this purpose, the writer understands, is alloyed with tungsten, and thoroughly satisfactory material has been obtained.

There is another source of trouble which I believe is the cause of some of the failures of group firing. When two or three apparatus are connected in series, it often happens that a connection is made to earth, of a greater or less resistance, and the wires connecting the different apparatus. It is found, for instance, where incandescent lamps are run in series, that sometimes the positive lamp of the series will burn more brightly than the remainder, and will consequently have a shorter life, the explanation being, that there is a partial earth beyond the first lamp, and consequently the current passing to the second and subsequent lamps is less than that passing to the first lamp. The same thing may happen in the matter of fuses. Coal is not a good conductor, but if some of the connecting wires touch it, it may make a sufficiently good connection to carry off a certain portion of the current, and to practically reproduce the conditions mentioned above, in connection with incandescent lamps.

THE IMPORTANCE OF CARE AND MEASUREMENT

The remedy for all the troubles that have been described, in the "colliery notes" referred to, and in this article, lies in care and measurement. One of the great advantages that electricity possesses, is the ability to take measurements with comparative ease. It is always a simple matter to insert a measuring apparatus, to show whether a current is passing, and if sufficient money is spent, the actual strength of the current, or the actual amount of the pressure. One of the precautions that could be taken, is to fix a small current indicator upon the case of the firing battery, which might be graduated to show approximately when the current passes for one, two, or more fuses, when connected in parallel, and it might also be arranged to show the pressure available from the battery, before the connection was made to the wires leading to the fuses.

The objection to the addition of such an apparatus, is two-fold; it in-

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creases the expense, and it makes something additional to get out of order; the expense, however, will be well incurred, if it enables the shot-firer to have a more complete command of his shots than he has at present. The additional cost of a current and pressure indicator would not be very great; and if each shot-firer always had the same battery, he could learn so to know the indications of the apparatus, as to be able to read with considerable accuracy, what has taken place in the shot holes.

Familiarity with an electrical measuring machine is of great importance, and it gives the user a complete command over the apparatus he is using. In the early days of electricity I had an old lineman's indicator that I always carried with me when I had tests to make. It was my boast that I could find out anything that had happened to signals, telephones, and even electric-light apparatus by using the indicator; it is certainly true that shot-firers would obtain a similar skill, once they thoroughly understood an indicator of this kind.

Possible Improvements

Another point where improvements might be made is in the size and quality of the wire employed for connecting the firing battery to the wires leading into the fuses, and the wires attached to the fuses themselves. The idea has prevailed that small wires and poor insulation is sufficient for the purpose, and the view is correct up to a certain point. If only one fuse is to be fired, the problems involved in the size of the wire and its insulation do not come in appreciably; but when low tension fuses are to be fired in parallel, the size of the wire may have an important bearing upon the pressure available for the fuses; if, in addition, there is a partial earth on between the fuses, the defect already mentioned, the cutting off of a portion of the current from the second and following fuses may easily be brought about. The insulation of the wire connecting the battery to the fuses, and of the wires in the shot hole leading to the fuses themselves, would also be much better if the insulation was higher than is usual, for the reasons given above. The problem involved in the insulation of these wires is somewhat similar to that of the insulation of wires for electric signals in mines, and for the electric bells in houses. In both cases, small wires and light insulation would answer perfectly, if nothing had to be considered but keeping the wires clear of each other, off dry wood, and if the wires were not subject to damp, rough handling. But experience has shown that for continuous work, a large wire answers best in both cases, and a comparatively high amount of insulation; the same reasoning applies to the wires employed for shot firing. If the wires lying on the ground leading from the battery to the shot holes are well insulated, there will be less chance of the wires in the shot holes making a leak, in case they touch the coal.

Another precaution is to see that the fuses and shot-firing batteries are tested, both before going down the pit, and as far as possible, up to the moment of firing the charge. The indicator suggested above will answer for testing the battery; immediately the latter shows an appreciable loss of pressure, it should be sent in to be overhauled. The question of testing the fuses is a somewhat more difficult one, but by no means insuperable, with the knowledge that has been acquired by mining men, of electrical apparatus, during the last 20 years. The low-tension fuses can be tested with the same indicator mentioned above, and a single dry cell. The test is a simple one, and easily carried out. A circuit is made of the dry cell, the indicator and the fuse, and the deflection of the needle of the indicator should be noted. It is not quite sufficient to be sure that the circuit is complete within the fuse. The shot-firer should also make sure that the circuit within the fuse is as it should be, and the indicator will show this. As explained above, when the shot-firer gets to know the indicator, it will tell him all about every fuse that passes through his hands, and he will know quickly, by connecting up in this way, whether or not the fuse is good.

Method of Testing Fuses

It is a simple matter to test all fuses when they arrive. The batch of fuses that are taken into the pit should be tested before going underground, and they should be examined the last thing before fixing them in the shot hole. The small platinum wires are exceedingly delicate, and apt to be detached from the copper wires to which they are connected. The jolting of the cage, or the motions of the man who carries them as he walks, may cause one of the fuses to become disconnected.

For high-tension fuses, the test is more difficult, but can easily be arranged. The test the writer suggests is a resistance test, made with an apparatus called a Wheatstone's bridge. The Wheatstone's bridge is the apparatus employed by electrical engineers, in various forms, for testing resistances. It may be a delicate and formidable apparatus, and is so, when arranged for delicate laboratory tests. But on the other hand, portable, knock-about forms are made, arranged so that tests of the kind suggested can easily and quickly be carried out, and with sufficient accuracy for the purpose. A somewhat similar series of tests are carried out in copper-smelting works in the United Kingdom for the purpose of determining the purity of each batch of copper produced. A small sample of the copper is taken and drawn into a wire of definite length and of prescribed sectional area, and this is connected to two terminals of a Wheatstone's bridge, kept in the manager's office; in this way, the standard of the copper is quickly obtained. Similarly, as readers of the Engineering and Mining Journal will probably know, each of the filaments of the millions of incandescent electric electric lamps that are turned out, are tested for resistance by a similar apparatus, and the testing is done usually by a girl.

Instrument makers will have no difficulty whatever in producing a portable apparatus that will answer the purpose described, and shot-firers, once they are instructed, will have no difficulty in testing their fuses, before taking them down the pit. There are two dangers in connection with the high-tension fuse that a resistance would show. The copper wires may be too far apart for the available spark to jump the space, and on the other hand, the wires may be so misplaced that there is no space to jump. The shot-firer would quickly learn to diagnose both these troubles. I believe that if the above is followed a great many, if not all the troubles that have attended group firing, will gradually disappear.

According to one excellent authority, "mixtures of firedamp and air are only capable of transmitting flame within certain limits. There must be from 5 to 20 per cent. by volume of firedamp in the mixture. The case, with respect to coal dust and air, is not parallel. One pound of coal dust and 160 cu.ft. of air are required for complete combustion. Assuming an airway to be 8 ft. by 5 ft. sectional area, and taking coal dust to weigh 26 lb. per cu.ft., then for each 160 cu.ft. of air in such a road to be supplied with 1 lb. of coal dust, the road surface must be coated with a film of dust 1/228 in. thick. This quantity is far below the average supply of fine coal present on an ordinarily dusty road. It seems that in a coal-dust explosion, a minimum quantity of dust must be present, which is probably much greater than the quantity required for perfect combustion; but practically no maximum is required."

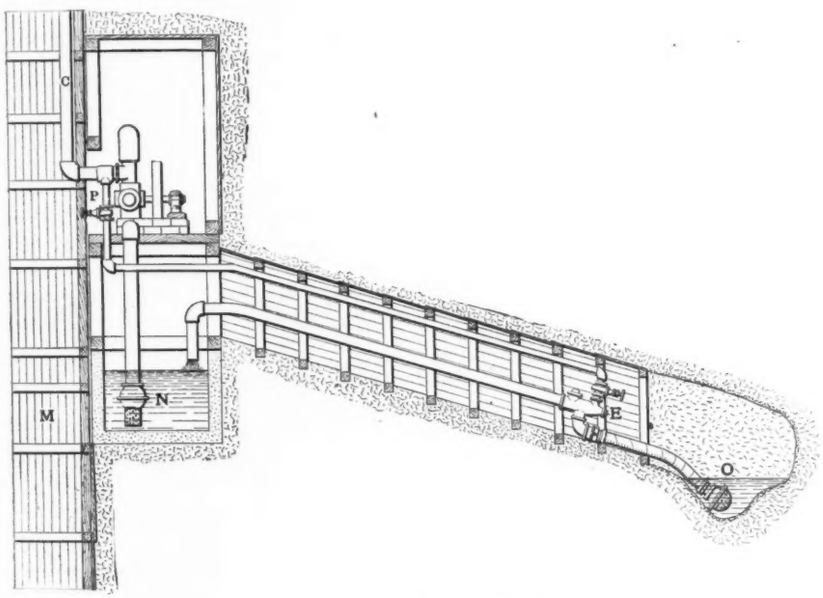
At the Dos Estrellas mine, in the Tlalpujahua district, Michoacan (*Mexican Mining Journal*, June, 1908), the cost of mining and milling the ore per ton is as follows: Mining, including development, 4.96 *pesos*; milling, 1.24; cyaniding, 1.70; assaying, 0.07; general expenses, 0.91; taxes on ore, 0.30; total, 9.18 *pesos*. The ore is a quartz carrying silver both as a sulphide and as a chloride, while the gold occurs both native and included in the silver sulphide.

In France small deposits of asbestos are worked in the Pyrenees, in Dauphiny and in the island of Corsica. The production last year is not reported.

The Koerting Water-jet Eductor

It occasionally happens in a mine of large vertical extent, one of whose lower levels comes to surface through an adit, or tunnel, that a flow of water in an upper level can be impounded and made to do service in pumping, compressing, or motor-driving for the whole mine, and be discharged through the adit level.

An apparatus for utilizing power of this sort, for the purpose of draining lower workings, has been put on the market by the Schutte & Koerting Company, of Philadelphia. The "Eductor" is small and light, in comparison with ordinary pumps, has no moving parts, nor valves, and requires no packing. It will work efficiently with a pressure head of only a few yards, and with all ranges of suction lift up to 16 ft., and, of course, consumes only natural power.



KOERTING WATER-JET EDUCTOR

P, Main Pump; E, Eductor; O, Sump; C, Column Pipe

Another application of the "Eductor," for mining purposes, is found in shaft sinking in watery ground. The apparatus can be lowered to the sump, and raise the water to the next permanent pumping station above. The pressure water for this operation can be secured by tapping the main column pipe above the pumping station as shown in the illustration.

The total number of feet drilled in the Alaska United mine in 1907 was 195,396; the total amount of ore and waste broken was 224,866 tons or 1.15 tons per foot.

The discovery of a promising graphite deposit is reported (*New Zealand Mines Record*, March 16, 1908) at Cuttle Cove, Preservation Inlet, New Zealand.

The Anti-foreign Wave in Mexico

Commenting editorially on what it characterizes as an anti-foreign "wave," the Mexican *Herald* deplores that such a sentiment should have gained so widespread a recognition throughout Mexico. During the last few weeks the feeling against foreigners, particularly against Americans, has been most bitterly stated in the Mexican press, and in specially prepared pamphlets which have been distributed gratis. Most of these attacks come from sources so ill-informed that they have attracted little serious comment, but the latest attack from the pen of an educated and well-known writer of the City of Mexico has awakened the astonishment of all Americans residing in the republic.

In some of the outlying districts priests have circulated anti-American pamphlets which, while full of absurd misstatements, the paper thinks may have a bad effect upon "the masses of an impressionable, but as yet somewhat ignorant, common people." The unaccountable wave of anti-Americanism, coming as it does at a time when certain anti-foreign measures are being vigorously pressed before the national Congress, notably the proposed anti-foreign mining law and that restricting the right of foreigners to practice the learned professions, is considered unfortunate by enlightened Mexicans, as well as by foreigners. The *Herald* sums the situation in the following language: "The printed attacks to which we have alluded, circulated not only in this city, but in the remotest country districts and mining towns, where small groups of foreigners live in complete isolation, and around whom it is manifestly unfair to throw an atmosphere of prejudice and antipathy."

The Question of Steel Prices

The Pittsburg correspondent of the New York *Evening Post* gives the following interesting contribution respecting the question of steel prices, which has been recently, and still is, an important subject of discussion:

At the last conference which decided to maintain prices, there was a decided coolness toward the "stand pat" policy on the part of practically all representatives from this district. They agreed to the maintenance of the existing price schedule under quiet protest. One of the independents put it thus, in an interview, June 12:

"Judge Gary is a jurist, and successful; Mr. Morgan is a banker, and successful. As such, their opinions were respected. More than this, they represented the United States Steel Corporation, the largest interest in the trade. When we first went to New York we were the guests of Judge Gary at dinner, and Mr. Morgan was there. The influence of the two was mighty. But a lifetime of experience in the steel business told us that financial depression must mean readjustments. The stock market itself had gone through its period of adjustment, and so had the banking situation.

"Yet some of the older manufacturers, who urged an immediate lowering of prices and an adjustment of wages in their industry, were told that conditions had changed since the old days through the concentration of the trade. We still believed in the old governing law of supply and demand, and in an adjustment of prices to a level justified by conditions. Events are proving that times have not changed so materially as some believed, and that prices are going to be regulated by the laws of supply and demand and general conditions, just as they were in the past."

According to the *Canadian Engineer*, June 5, 1908, the Department of Mines, Ottawa, will undertake this year important experimental work in respect to the utilization of the large peat deposits scattered throughout the Dominion. The supplementary estimate will include an item for the establishment of an experimental plant, probably in Ottawa, where investigations will be carried on in the methods of obtaining producer gas from peat, and into other modern methods of using peat for various industrial and domestic purposes.

Asbestos is found in the island of Cyprus in the Mediterranean. A company, organized in 1906, obtained a concession in that island and began to open a mine early in 1907. It is reported that 1000 tons of asbestos were mined up to the end of the year.

Bethlehem Steel Corporation

The Bethlehem Steel Corporation has issued its third annual report, covering the fiscal year ended Dec. 31, 1907. The comparative statement of surplus account is shown in the accompanying table:

COMPARATIVE SURPLUS ACCOUNT.

	1906.	1907.
Net m'f'g. profits	$1,212,160	$2,569,252
Other income	152,015	69,705
Total income	$1,364,175	$2,638,957
Interest and other charges, excess of book value	601,426	1,020,169
Net income for year	762,749	1,618,788
Previous surplus	1,843,619	593,422
	$2,606,368	$2,212,210
Extraordinary losses and charges	$1,118,467	.....
	$1,487,901	$2,212,210
Less dividends on pfd. stock	894,480	111,810
Surplus at close of year.	$593,421	$2,100,400

BETHLEHEM STEEL COMPANY

During 1907 two new mills were completed, together with the open-hearth furnaces, boiler, pumping and electrical plants, railroads, etc., necessary for their operation. The rail mills started Sept. 3, 1907, and to Dec. 31, rolled 33,754 tons of open-hearth steel rails. The special structural mill began operation Jan. 9, 1908. The 28-in. standard structural mill is being completed, and is expected to begin rolling about July 1, 1908.

The total expenditures for improvements and additions to the original plant to date have been $4,638,778, and for the new plant there has been spent to Dec. 31, 1907, $8,322,215, making a total expenditure of $12,960,993.

NEW PLANTS

The expenditures for the new plants include the purchase of about 250 acres of land and the erection of a complete plant for the manufacture of structural material and rails, comprising ten 60-ton open-hearth furnaces; one 46-in. blooming mill, one 48-in. intermediate mill and one 48-in. finishing mill for special structural shapes; one 40-in. blooming mill, serving a 28-in. standard structural mill, and a 28-in. rail mill; structural finishing shop; heating furnaces; storage yards; shipping yards; electric light and power plant; water-pumping station; locomotives and cars; scrap-breaking plant and complete equipment.

ORIGINAL PLANT

To the old plant has been added one blast furnace, with the necessary hot-blast stoves; four new hot-blast stoves for existing furnaces; the existing hot-blast stoves have been increased in hight; two raw-material storage yards, including car dumper, storage crane and complete equipment, with trestle and stock bins to serve all furnaces; three new blowing engines; one 8000-h.p. boiler plant; new iron and cinder ladle cars, and an additional pig-casting machine. To the No. 1 open-hearth plant there was added one 75-ton electric crane and crane runway. In the steel foundry, a building for cleaning castings was built, including necessary overhead crane and machine; a new open-hearth furnace and four additional core ovens, with one new annealing furnace, new cranes and crane runways, and a general extension to the foundry equipment was added. Additional buildings, cranes, runways and equipment for making tunnel segments, additional pattern sheds and general equipment was also added to the iron foundry. Besides these improvements a brass foundry was built and a crucible-steel department, comprising one 5-ton open-hearth furnace, two 30-pot crucible furnaces, and a forging plant with its equipment was installed.

The capacity of the rolling mill was increased by eight puddle furnaces, an additional shear, boilers at the puddle and heating furnaces, cold saws for existing 12- and 22-in. mills, a new 12-in. staybolt mill with entire equipment, a new 8-in. mill for rolling tool steel, and a new crane and runway to serve all mills. A drop-forge department was introduced containing an entire new plant and equipment for the manufacture of automobile and miscellaneous drop forging. An entire new plant for the manufacture of projectiles also was installed.

During 1907 new shops were completed and were equipped with the necessary machinery and tools, blacksmith, carpenter and pattern shops, and an additional boiler plant and structural shop with complete equipment were added. Besides these improvements there were added one 6000-h.p. boiler plant with steam lines to the new department, an electric-light department, an electric light and power station, an additional water main for fire protection, 25 steel dump cars, 50 broad-gage steel cars, one broad- and one narrow-gage locomotive, broad-gage locomotive cranes, a new scrap drop, 55 additional houses for employees, and a new general office building.

The erection of the new plant and the installation of additional equipment was decided upon to offset the anticipated decrease of Government orders, and that the step was a wise one is evidenced by the following figures showing Government work on hand at the end of the last three years: 1905, $4,455,470; 1906, 4,056,062; 1907, $2,635,056.

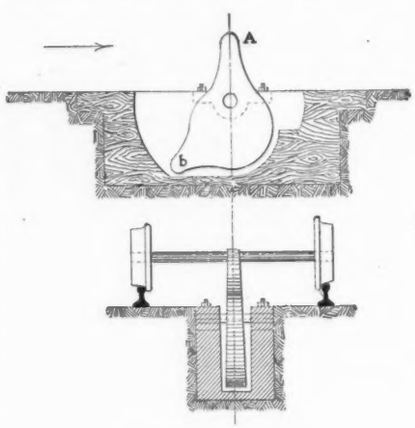
OTHER SUBSIDIARY COMPANIES

The mines of the Juragua Iron Company, a subsidiary company to the Bethlehem Steel Company, operated continuously during 1907, producing 181,063 tons of bessemer ore, all of which was shipped to the Bethlehem Steel Company. Development work shows constantly increasing tonnages of ore, and the mines are now shipping about 30,000 tons per month; this will be gradually increased with the installation of the new equipment and the opening of further orebodies. The ownership of these mines constitutes a most valuable asset to the Bethlehem Steel Company, assuring it an independent source of supply for ore at a cost much below the open market.

The Union Iron Works at San Francisco completed six of its seven ships at a loss, which was less than had been anticipated. The Eastern Shipbuilding Corporation was sold, and the Crescent and Carteret plants were consolidated with the Samuel L. Moore & Sons Corporation, of Elizabethport, N. J. The plant of the Harlan & Hollingsworth Corporation was closed down during the last portion of the year, and this materially reduced the operating profit for the year.

Runaway Car Stop

A German device for stopping a runaway car on a down grade is shown in the acompanying illustration. It is, of course, applicable only on the down track. It consists of a thick wrought-iron disk with two horns hung between the rails in such a way that the horn *A* normally stands upright. A car coming down at



RUNAWAY CAR STOP

a moderate speed will strike the horn with its forward and then with its rear axle, sliding over it unhindered. If, however, a car travels at too great a speed, as when the tail rope breaks, the forward axle will strike the horn *A* such a blow that the horn *b* will be thrown upward far enough to catch the rear axle in time to hold it.

California has afforded only one important lead-producing district, viz., Cerro Gordo, in Inyo county, which made an important output of lead between 1869 and 1880 and developed a thriving and instructive smelting industry. Some other lead-producing districts were subsequently developed in the same county, especially Darwin, but after the exhaustion of Cerro Gordo, the output of lead in California became insignificant.

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*Illustrated.

The Proposed Legislation in Mexico

The proposed law, excluding foreign companies from the ownership of mining property in Mexico, to which we referred last week, was drafted by Señor Molina, the minister of Fomento. The fact that it was fathered by a member of the government is the reason why it has excited so much discussion. Otherwise it would doubtless have been dismissed as a piece of midsummer madness not worthy of serious attention. Why a responsible minister should introduce such a project passes all understanding. The lame reasons assigned for it are printed elsewhere in this issue. Probably it is merely a manifestation of the wave of anti-American sentiment which appears to be pervading certain quarters in Mexico, although Mexican hostility to the United States is not easy to comprehend, in view of the noteworthy way in which the two countries have been coöperating, both in industrial and in political matters. Their community of interest is so patent that it is hard to conceive of a deliberate action that would inevitably dispel their harmony.

It is pleasant to hear that the proposed law has aroused such a storm of protest on the part of American investors in Mexico that President Diaz has requested that the bill be submitted to him for careful study. It is reported already that the bill meets with his disapproval, which will probably be the end of it. If formal consignment to a pigeon-hole has not already been ordered, we venture to predict that it will be. President Diaz was the great builder of Mexico. He is not likely to sit idly by while his handiwork is disrupted.

The World's Production of Copper

According to the statistics which we have collected directly from the producers in the United States, Canada and Mexico, and the statistics of Henry R. Merton & Co. for the remainder of the world, the total production of copper in 1907 was 723,807 metric tons against 715,523 metric tons in 1906. So large an increase is somewhat surprising. However, although the United States and Mexico made increased outputs, there were many important producing countries, including Spain and Portugal, Germany and Chile, which remained about stationary, while on the other hand, there were several countries which made greatly increased outputs, the most noteworthy among these being Australasia, Canada, Japan and Russia. The largest proportionate increase was made by Russia, whose output increased 50 per cent., chiefly because of the operations of the new companies which have become interested in the copper mines of that Empire during the last few years. The increase in the production of Japan was 25 per cent., while the increase in the production of Australasia was considerably upward of 10 per cent.

The production of the principal copper-producing countries of the world in 1907 was as given in the accompanying table, the figures for 1905 and 1906 being added for comparison.

COPPER PRODUCTION OF THE WORLD
(IN METRIC TONS.)

Country.	1905.	1906.	1907.
Australasia	34,483	36,830	41,910
Canada	21,588	19,106	21,022
Chile	29,632	26,157	27,112
Germany	22,492	20,665	20,818
Japan	36,485	40,528	49,718
Mexico	70,010	62,690	61,127
Peru	8,763	8,641	10,744
Russia	8,839	10,658	15,240
Spain-Portugal	45,527	50,109	50,474
United States	397,003	416,226	398,736
Others	24,692	23,913	26,906
Totals	699,514	715,523	723,807

It appears from the above table that the proportion of the total contributed by North America (exclusive of Newfoundland) was 66.44 per cent. in 1907 against 69.60 per cent. in 1906 and 69.85 per cent. in 1905.

The Orphan Copper Company

We do not often refer to the prospectuses of mining companies soliciting subscriptions, which are constantly being presented to the public, but certain points in connection with a current promotion, viz, the Orphan Copper Company, deserve attention, especially in view of the fact that the promotion is being made by a reputable firm, which has membership in the New York Stock Exchange. It is stated that the Orphan Copper Company owns property near Globe, Arizona, immediately contiguous to that of the Miami Copper Company, and the second paragraph of the prospectus is devoted to the Miami Copper Company, with references to Adolph Lewisohn and J. Parke Channing, respectively, the president and en-

gineer of that company. In a special notice accompanying the prospectus is the reprint of a clipping from a local newspaper, telling about the developments in the Miami mine. It is then remarked that "the conservatism of the statement relative to there being 3,000,000 tons of ore in sight in the Miami copper mine can be appreciated by reading the above." This is signed by the Orphan Copper Company. Also accompanying the prospectus is a map of "The property of the Orphan Copper Company and contiguous claims," which shows two Miami groups, to one of which the Orphan group is contiguous. However, there is nowhere any indication that the Miami group which contains the developed mine is the non-contiguous group, the nearest approach of whose lines to the Orphan group is 750 ft. according to the map referred to, two other properties intervening between the Orphan group and the non-contiguous Miami group.

The character of the prospectus of the Orphan Copper Company gives the impression of a desire to hang to the skirts of the Miami. It looks peculiar that a company should in its prospectus state the tonnage of ore developed in a neighboring mine and give no figures respecting the tonnage of ore developed in its own mine. As to the latter, a report is presented by Charles M. Clark, mining engineer, of Globe, Ariz., who is vice-president of the Orphan Copper Company.

Mr. Clark states that "the mine today is practically a shipper, but I recommend a development period of from four to six months to determine the extent of the orebodies already uncovered. At the end of this period the mine should show a large ore reserve available for stoping and be in condition to furnish sufficient ore for a concentrating mill of at least 50 tons per day capacity. . . . The concentrating tests have shown that the ore can be readily concentrated 10 into 1, and the resulting concentrate smelted with a yield of at least 2½ per cent. in fine copper. . . . The concentrating plant, at the time of its completion, will be of sufficient capacity to care for the output of the mine. . . . It is estimated that before the end of a year the property will call for a concentrating plant with a daily capacity of at least 200 tons."

The capital of the company is $3,000,000, divided into 600,000 shares of $5 par value, of which 150,000 shares have been put in the treasury. For the purpose of providing funds for development, 100,000 shares of stock, whereof 50,000 shares are treasury shares and 50,000 shares are owned by the vendors, are offered for sale at $2.50 per share.

A yield of 50 lb. of copper per ton of ore, 50 tons of ore per day, and 300 days per annum would correspond to a total of 750,000 lb. of copper, which, at 13c., would be worth $97,500 at New York. Inasmuch as the ore must be mined, milled and smelted to secure this amount of copper, and the copper must be carried to New York and refined, it is obvious that the net proceeds of 50 tons of ore per day will not be large.

The Anthracite Companies and the Hepburn Law

Arguments are being heard this week, in the United States Circuit Court in Philadelphia, in the suits brought by the Government to enforce the commodity clause of the interstate commerce law, commonly known as the Hepburn act. This is a test case, the anthracite-carrying railroad companies having been selected as the most conspicuous cases of violation of the law. There is no dispute as to the facts in the case, the companies themselves having aided the legal officers of the Government by furnishing full statements. The law in question imposes heavy penalties on railroads engaged in interstate commerce for carrying any commodities in the production and sale of which they are interested.

The suits are brought against seven railroad companies which are carriers of anthracite coal, and the list includes all of those generally known as the anthracite roads, with one exception. For some reason the New York, Ontario & Western has not been included. The defendant companies are classified in three groups. In the first are the Delaware & Hudson and the Delaware, Lackawanna & Western, which directly own and operate the coal mines, the product of which they carry to market. In the second group are four companies—the Lehigh Valley, the Central of New Jersey, the Pennsylvania and the Erie—which operate coal mines through the agency of subsidiary companies, all, or nearly all, of the stock in such corporations being held by the railroad companies. The third class includes only one company which stands by itself; the Reading Company is not an operating but a holding company, owning the stocks of both the Philadelphia & Reading Coal and Iron Company, the latter mining and selling the coal which is carried by the railroad.

As before noted, there will be no jury trial to determine the facts, which are not in dispute. Only formal proof will probably be submitted, and the court will pass on the legal questions involved. The brief submitted in advance by the attorneys for the Reading outlines the broad ground to be taken by the defense. This is that the law is unconstitutional because, (1) it does not regulate but absolutely prohibits the interstate transportation of the anthracite coal produced or handled by the defendant companies; (2) that the effect of the enforcement of the law will constitute a taking of the property, corporate rights and franchises of the defendant without due process of law and without compensation; (3) that the law is discriminative in its terms, as it permits railroad companies to transport timber which they own, while prohibiting the carriage of other commodities in which they are interested; (4) that the penalties provided are so great and so unduly excessive and extortionate as to be substantially destructive of the property and franchises of the carriers affected thereby, and in respect to such carriers to constitute a denial of the equal protection of the law.

The further pleas relate to the peculiar position of the Reading as above described. Substantially the same pleadings are submitted by all the companies, so far as general terms are concerned. In addition the Lackawanna and the Delaware & Hudson claim as contracts their original charters, constituting them mining as well as carrying companies. In view of the importance of these cases the present trial may be regarded as only a preliminary, as in any event they will undoubtedly be carried up to the Supreme Court of the United States for final decision.

The law affects many other companies, but probably no further effort will be made to enforce it until these test cases are decided. In a number of instances railroad companies have taken action in advance, by divesting themselves, at least formally, of the ownership of coal companies on their lines.

Meeting of Coal-mine Inspectors to Form a Permanent Organization

SPECIAL CORRESPONDENCE

About 79 inspectors, deputy mine inspectors and members of the mining boards from the different States held a three days' meeting in the Senate Chamber of the State House at Indianapolis, June 9, 10 and 11, 1908. The meeting was called to discuss methods of inspection and to exchange ideas in regard to the best plans for preventing explosions and serious accidents in mines and to effect a permanent organization. James Epperson, inspector for Indiana, was made chairman and J. W. Paul, of West Virginia, was made secretary. The meeting was called and arranged for by Mr. Epperson, of Indiana, George Harrison, of Ohio, J. W. Paul, of West Virginia and J. T. Beard, of Scranton, Pennsylvania.

After completing a permanent organization and giving it the name of the "Mine Inspectors' Institute of the United States of America," the delegates listened to the reading of an interesting paper by Clarence Hall, of the United States Geological Survey, Washington, D. C., relative to the efforts which the Government is making to improve the conditions of the mines. Congress has made an appropriation of $150,000 to start an investigation into the causes of mine explosions and the methods of preventing them. It was stated that Pittsburg, Penn., had been selected as the principal headquarters for carrying on the investigations, because of its more central location. The Government Arsenal buildings at Pittsburg will be remodeled and laboratories will be constructed and equipped with all apparatus necessary for testing explosives. During July and August, three foreign mine experts from Belgium will come to the United States and lend their assistance in starting the investigations, which are to be carried on by the Government. They will also visit the different coal districts of the United States and their advice and experience will be relied upon to some extent in carrying out the work successfully.

It is by no means the intention of the Federal Government, Mr. Hall said, to interfere with the rights of the various States over their coal mines nor to make inspections or regulations. The control of the mines will rest entirely with the State mine inspectors, and the work of the Federal Government will be purely for scientific research—an investigation for educational work principally. It is expected that the work will result in furnishing such information as will serve as a basis for intelligent State legislation, which will help and not hinder the mining interests.

There will be a large explosive gallery and observation house made of boiler-plate, with port holes covered with half-inch plate glass, so as to allow those in the observation house to see whether or not there has been an explosion in the explosion gallery and also to observe the nature of the explosion. Coal dust and air, or firedamp and air will be placed in the explosive gallery, and then the explosives will be shot into the gallery from a point 60 ft. away. The firedamp and air will be thoroughly mixed by an electric fan. In this way the effects of many different explosives will be studied.

All explosives, if used in large quantities, will ignite firedamp or coal dust; tests will be made with various explosives and the maximum quantity of each explosive that can safely be used in mines will be published under the head of "permissible explosives."

The conditions under which electricity may be safely used in coal mines for haulage and other purposes, also whether an electric spark may cause a coal-dust explosion, or if gas must be present, and the percentage necessary, will also be considered.

Variations in the composition of firedamp, atmospheric conditions, depth of mines, origin of outbursts of gas, general conditions under which dust explosions in coal mines may or may not be possible or probable from blown-out shots, from electric sparks, or other causes will all be studied by careful tests.

An outline of the proposed investigations at the Federal testing station at Pittsburg, was presented; it was also stated that a test of the sample of explosive taken from the Whipple mine, West Virginia, in which an accident in May resulted in the death of fifteen men, was found to be a mixture containing 50 per cent, nitro-glycerin, a grade of explosive most unsuited for coal-mine operations, and the use of which would be forbidden in any other country. Much interest was manifested in Mr. Hall's paper which provoked quite a discussion. James Bingham, attorney general of Indiana, was next introduced and addressed the meeting. He emphasized the duty of the inspectors of mines in the different States to see to it that the laws are observed by the mining companies. This, he said, would in many cases prevent losses of life.

George L. Harrison, inspector of mines of Ohio addressed the meeting on the increasing need of coal and the gradual decrease in the number of skilled miners, and drifted to the general responsibility of mineowners. He said mine operators should be held responsible for the acts of those in charge of their mines. He declared that the responsibilities and duties of superintendents, mine bosses, fire bosses and other employees should be clearly defined by laws carrying severe penalties for violation or non-compliance. The discipline among employees, and obedience to orders of the management as defined by law and corresponding penalties for violations should also be a subject of legislative enactment. It was further suggested that the management should be held responsible for the enforcement of the law, and the prosecution of the offenders should be sustained by the mine inspectors. Mr. Harrison concluded with a review of the explosion in the Monongah mine which occurred in December, 1907. In discussing the lessons to be derived from it he said the connecting of mining properties, especially in large territories is a dangerous proposition and should be prohibited by law. During the remaining sessions of the meeting a number of questions calculated to lessen the losses of life in the mines were discussed.

Dr. A. M. Comely, of Chester, Penn., asserted that there is none of the so-called safety explosives that is absolutely safe. Some, however, are more nearly safe than others. He explained that the qualities of a safety explosive are short length of flame, short duration of flame, low velocity of detonation and small number of heat units given off. He advocated the use of safety explosives, especially in mines where there is a great deal of coal dust. In several States efforts are being made to provide by law for the use of such explosives.

P. H. Donnelly, of Chicago, formerly a member of the miners' examining board of Illinois, and Philip Penna, of Terre Haute, secretary of the Indiana Operators' Association, addressed the meeting. Both commended the efforts of the inspectors toward organization and coöperation and both declared that the blame for accidents in mines does not fall altogether on one class of persons. In many instances, Mr. Penna declared, the men injured were responsible for their own injuries. Both speakers believed that vigorous efforts and coöperation on the part of mine inspectors of the several States would do much toward preventing accidents.

These declarations opened up the subject and D. J. Roderick, of Pennsylvania said that it is the dare-devil attitude of the miners and mine bosses that is largely responsible for the great number of accidents in coal mines. "About the time the annual report of accidents in mines is received, the mine bosses and others are appalled by the great number of deaths and the number of helpless widows and orphans that are left." Mr. Roderick further stated that many of the accidental deaths among foreigners were due to a lack of a proper understanding of the rules and instructions. This class of men should be in charge of a man who understands the English language and who can read and properly interpret the rules and laws.

J. M. Gray, chief mine inspector for Alabama, discussed the danger of electric explosions in mines and took the ground that many explosions which are claimed to be dust explosions, are due, in fact to the electricity in the air in the mines. The

explosions, he explained, are similar to a flash of lightning passing through the mines.

Resolutions were passed praising and commending the Government for the steps taken by the United States Geological Survey Department, and pledging the coöperation of the Mine Inspectors' Institute for the purpose of conducting such investigations and making such experiments as will be of value and conducive to the minimizing of mine accidents.

A resolution advocating the passage of the bill now pending in Congress providing for the Bureau of Mines was voted down after considerable discussion. It was charged that such a bureau would be in charge of politicians without practical knowledge of mines or mine conditions and would most likely interfere with the progress now being made under the mining departments of the several States.

James Epperson, inspector for Indiana, and J. T. Beard, of Scranton, Penn., came in for a vote of thanks for their part in promoting the organization and arranging for such a successful meeting. The next annual meeting will be held in Scranton, Penn., which will afford an opportunity to visit the experiment station in Pittsburg to be established by the Government.

Mr. Epperson, of Indiana, declined the presidency, stating that he had already had his share of honor in presiding over the first meeting of the kind ever held in this country. The following officers were elected: President, George L. Harrison, Ohio; vice-presidents, Thomas Moses, of Illinois, Robert Irving, of Indiana and John Virner, of Iowa; secretary, J. W. Paul, West Virginia; treasurer, Thos. Hudson, of Illinois.

Proposed Anti-foreign Mining Law in Mexico

A statement by Minister of Fomento Molina, which appeared in a recent issue of the Mexican *Herald,* explains the attitude of the authors of the proposed new Mexican mining law, especially respecting those clauses which refer to foreigners and foreign companies.

"The law of Feb. 1, 1856, which is now in force," he says, "requires certain requisites in order that the citizens or subjects of foreign countries may acquire realty in a zone within 20 leagues of the frontiers of our republic. Article 141 of the new measure reproduces this disposition, extending it with respect to mining property to the entire area of the frontier States and Territories.

"This is only a measure for good order, whose justification is scarcely necessary. It is well known that on the frontiers of two countries there flock dangerous adventurers, men of doubtful reputation, genuine criminals in many cases, who choose for their residences those places in which it will be easy to escape the action of the authorities of one country by crossing the frontier into another.

"The legislator complies with his duties in establishing especial requisites in order that foreigners may acquire mining properties in the frontier regions of the republic which must remove the possibilities of international conflicts or claims. If our legislation appears to be exacting in this respect, the laws of other countries go much further, in some absolutely denying to foreigners the right to acquire mining properties.

"Article 144 establishes the principle of the inability of foreign companies to acquire mines and mining rights throughout the national territory. This is a novelty in our legislation, although similar prohibitions have existed in the laws of other countries. Until now our laws have been very liberal, permitting to foreign companies, with slight limitations derived from the law of February 1, 1856, the exercise of the same rights which are conceded to Mexican companies. It must be admitted that to this liberality, in a large measure, is due the great progress which has been attained by our national industries. But circumstances have changed and legislation should be modified according to circumstances.

"A company is the exclusive creation of the law. Every country has the sovereign right to give life to this class of entities and confer on them the rights which are deemed commensurate with certain economic and political needs. When a country treats of giving small or large fractions of territory, of conferring dominion over that land, it is natural that the country in question demands certain conditions of the physical or moral persons on whom the law confers the privilege of owning lands. If this privilege is conceded to societies or companies it is natural that it requires that they be of the creation of that country, those which owe their existence to the laws of that country, and it is also natural that it deny such privileges to moral entities born under the protection of foreign laws and by the will of a public power which has jurisdiction only within the limits of its own territory.

"Admitting the foregoing principles it will free us from the great evils occasioned by monopolizing combinations, which, under the vulgar name of trusts, have provoked, by their acts, such intense agitation in the neighboring country to the north. Without denying the advantages which in not a few cases are offered for the development of industry by the free combination of societies, mercantile or industrial, for the management of their businesses, we should reserve to ourselves the sovereign right to legislate in this matter in that which refers to properties located in this republic. With the restrictions which this measure establishes, it will be difficult for companies to fall into the hands of the powerful trusts over which neither our government nor our laws can exercise any authority."

The Murder of William R. Boggs, Jr.

Last November we published an account of the murder of William R. Boggs, Jr., in Mexico, as reported in the press despatches. It appears that those accounts were not strictly correct. Mr. Boggs was a very well known mining engineer and metallurgist, with many friends in the profession who will be interested in the statement of Lewis Warfield, manager of the Topia Mining Company, respecting the manner of the death of Mr. Boggs at Topia. Mr. Warfield's statement is as follows:

"Through some necessary changes we were making in our property, the mill crew became in a degree disorganized. Mr. Boggs, a quiet unassuming gentleman, entered our employ in August. In attempting to bring order into the ranks he secured the enmity of some of the men. This was especially true of one man, who had, against express rules, been selling liquor to the men on night duty in our mill. This man, Monarres by name, was told by Mr. Boggs that this liquor traffic must cease. The night of the murder, Sunday, Nov. 17, some seven men concealed themselves near where Mr. Boggs must pass in going from his office to his house. At 8:30, as nearly as the time can be fixed, Mr. Boggs in passing the spot where the men were concealed was set upon by two of the men, one of whom struck him in the forehead with a stone which felled him, senseless. Thereupon Monarres, who was the leader and instigator in this crime, and his immediate companion, with some blunt instruments brutally smashed his skull. The murder was discovered perhaps one hour later. The two principals were arrested the following Thursday week. The accessories were arrested, but were, for some reason best known to the judge before whom they appeared, set at liberty."

The outcome of the trial of the murderers has just been reported. Montenegro was discharged, and Monarres was sentenced to prison for five years. The result of the trial is considered by all conversant with the facts to be a gross miscarriage of justice and efforts are now being made by the relatives and friends of Mr. Boggs to secure, through the American Department of State, an adequate punishment of the murderers.

A considerable industry in the manufacture of asbestos products has grown up in Belgium within the past four years. The principal factories are at Antwerp and at Auvelais.

The Canadian Mining Institute

The council has arranged for an extended summer excursion to various points in the Dominion. Invitations extended to the Institution of Mining and Metallurgy, the Iron and Steel Institute and the Institute of Mining Engineers have brought a number of responses, and it is certain that many British engineers will accompany the members of the Canadian Institute.

The Summer Excursions

The entire period covered will be about six weeks; but to suit the convenience of members the time has been divided into three stages, so that members can join in one or more, as they desire. These stages are as follows:

Stage 1. *Nova Scotia and Quebec*—Quebec to Sydney, including, in Nova Scotia, visits to the Pictou and Glace bay coal mines, to the Sydney iron and steel works; and in Quebec, the asbestos and copper regions of the eastern townships. Time required, approximately, nine days.

Stage 2. *Ontario*—Montreal to Toronto, the Cobalt and Sudbury districts, including visits to Niagara Falls, the silver mines of the Cobalt area and the nickel-copper mines and metallurgical works at Sudbury. Time required, six days.

Stage 3. *Western*—North bay to Victoria, B. C., and return, including visits to the Fernie and Bankhead coal mines, the St. Eugene silver-lead mines at Moyie, the metallurgical works and the copper-gold mines of Rossland and Boundary, the Bonnington Falls power plant, etc., etc. Time required, 25 days.

The excursion will begin at Quebec, about Aug. 24 next.

Western Branch Meeting

The western branch of the Canadian Mining Institute held its spring meeting in Rossland, B. C. On the evening of May 13 the members were entertained by the Rossland Club. The meeting was held on May 14, and was opened by a brief address by A. B. W. Hodges, president of the branch, followed by other addresses from J. A. Macdonald and A. J. McMillan. On motion, R. W. Coulthard, of Fernie; Robert Hamilton, of Vancouver; and John L. Retallack, of Kaslo, were added to the council, the number of members being increased to 12. President Hodges referred to the proposed visit of the Institute to British Columbia in September. On recommendation of the council, a committee, consisting of A. B. W. Hodges, W. H. Aldridge and S. S. Fowler, was appointed to request the government to make a grant for the purpose of entertaining the foreign visitors who will come West with the Canadian Mining Institute in September.

The secretary read a paper by W. J. Watson, of the Tyee smelter at Ladysmith, on a "Matte Separating Foreheath," which had been used in the plant for two years. Among other advantages it affords are reduced wear and tear of matte pits, the stream of matte not striking the side of the pot, as in the ordinary method, the saving of tapping clay, the elimination of danger to men, being burned when tapping and dispensing with a tapper, and the saving of the wages of an extra man. This paper was discussed by Thomas Kiddie, F. W. Guernsey, A. B. W. Hodges, S. S. Folwer and E. Jacobs.

H. H. Claudet read a paper on the "Elmore Vacuum Oil Process," in which he said that the latest application of the process was that iron and zinc in an ore could be separated. At the Giant mine, near Golden, 14 per cent. lead ore was concentrated to 69 per cent. concentrates, leaving only 2 per cent. of lead in the tailings with the process. In Norway there were oil plants in which the cost of concentration was only 60 and 75c. per ton, exclusive of crushing. Specimens of the concentrates made by the process were shown. Dr. Porter, M. E. Purcell, S. S. Fowler and others debated the merits and qualities of the process.

C. M. Campbell, of the Granby mines, at Phœnix, read a paper on "Granby Mining Methods," in which he showed how mining is carried on in mines which in a few years have produced over 5,000,000 tons of ore. At one place in the mine the ledge measured horizontally and not directly across the dip, was 700 ft. in width. Mr. Campbell told how the large deposits were opened, the method of stoping, haulage and the many labor-saving devices used in the mine. Owing to the low grade of the ore and the large quantity necessary to be handled, every possible economical corner had to be cut in order to reduce expenses. A number of drawings and photographs, illustrating the text of the paper, were shown and admired by those present. It was debated at length by Dr. Porter, Paul E. Couldrey and others.

Frank E. Lathe, a student member, was presented the gold medal given by the Institute by President Hodges. Mr. Lathe's paper last year was the best of six submitted by student members.

Secretary E. Jacobs read a paper from notes given by Mr. Miller of the Tyee smelter, at Ladysmith, on an ingenious apparatus contrived by Mr. Miller for unloading ore from vessels, which excited considerable interest.

Dr. J. Bonsall Porter gave an interesting account of tests which were being conducted by the Dominion government in conjunction with McGill University, of the coals of Canada. The tests of the coals of Nova Scotia and New Brunswick were completed and work was now in progress on the coals of the West. The work was about half done and the end of the big task is about in sight. He was not in a position to give details, as they must first be furnished to the government.

A vote of thanks was tendered the local members for the arrangements. At the suggestion of Secretary Jacobs, it was decided that the officers of the branch be urged to press on the government the necessity of publishing the completed reports of the structural geological survey of the Rossland camp. A preliminary report has been already published.

This completed the formal business of the branch institute, and it adjourned.

On May 15, the day was spent by the visiting engineers in inspecting the Le Roi, Le Roi No. 2 and Centre Star mines, under escort of the managers, superintendents and shift bosses. Most of the visitors left for home on the evening train.

The local committee on entertainment of the visiting engineers consisted of A. G. Larson, J. S. C. Fraser, R. H. Stewart, W. S. Rugh, P. E. Couldrey, Graham Cruickshank and H. P. Dickinson.

Record Driving in the Rand Deep Levels

By E. M. Weston*

On the Simmer reef, which is about 4000 ft. deep, the record for driving established on the Cinderella reef has been lowered. The 15th level was advanced 294 ft. in 61 shifts of 10 hours. The size of the drive along the reef was 7x5 ft. One white man and six Chinese operated three Ingersoll-Sergeant 3¼-in. drills on one bar. One round was drilled and blasted each shift, and the average gained per round was 4.8 ft. Blasting gelatine was employed, and 50 lb. was used to advance 4.5 ft. or 11 lb. per ft. Fifty-nine of the rounds needed 14 holes with the usual three-hole center cut to break them; 100 rounds required only 12 holes.

The air pressure at the surface was 80 lb., and owing to the pressure gained at such great depths due to the difference in weight of a column of dense air compressed to 80 lb. in the pipes and the normal air in the mine pipe, friction was balanced and the air was supplied to the machines themselves at 80 lb. This gain in air pressure at about 4000 ft. equals 10 lb. per sq.in. Water was laid on, and an arrangement was also made whereby the water could be turned into the air pipe, making a spray after blasting and at once cooling the drive and laying the dust.

In comparing these results with those gained in adit driving in America it must be borne in mind that these drives are not straight, that mechanical haulage is not used and that the ground is generally harder and requires more holes and larger quantities of more powerful explosives, while the smaller size of the excavation does not give room for an economical arrangement of holes.

*Manager, Rand Collieries, Ltd., Brakpan, Transvaal.

New Publications

THERMOELEMENTE UND THERMOSAULEN. By Franz Peters. Pp. 180; illustrated. 6½x10 in.; paper, 10m. Halle a. S., 1908: Wilhelm Knapp.

DAS INNERE DER ERDE UND DER PLANETEN. By Heinrich Wehner. Pp. 74; illustrated. 6¼x9½ in.; paper, 2m. 50pfg. Freiberg, 1908: Craz & Gerlach.

TELEPHONE CONSTRUCTION, INSTALLATION, WIRING, OPERATION AND MAINTENANCE. By W. H. Radcliffe and H. C. Cushing, Jr. Pp. 171; illustrated. 4¼x7 in.; cloth, $1. New York, 1908: Norman W. Henley Publishing Company.

REPORT OF THE DEPARTMENT OF MINES, NOVA SCOTIA, FOR THE YEAR ENDED SEPTEMBER 30, 1907. By Hiram Donkin. Pp. 150; illustrated. 6½x9½ in.; paper. Halifax, N. S., 1908: Commissioner Public Works and Mines.

GAS POWER. F. E. Junge. Pp. 548; illustrated. 6x9 in.; cloth, $5. New York and London, 1908: Hill Publishing Company.

Contents: The evolution of gas power. Design and construction of large gas engines. The application of gas power.

THE ARKANSAS COALFIELD. By Arthur J. Collier, with Reports on the Paleontology. By David White and G. H. Girty. Bulletin No. 326, U. S. Geological Survey. Pp. 158; illustrated. 6x9 in.; paper. Washington, D. C., 1907: Government Printing Office.

GEOGRAPHY AND GEOLOGY OF A PORTION OF SOUTHWESTERN WYOMING WITH SPECIAL REFERENCE TO COAL AND OIL. By A. C. Veatch. U. S. Geological Survey, Professional Paper No. 56. Pp. 178, illustrated. 9x11½ in.; paper. Washington, 1907: Government Printing Office.

STEAM BOILERS, ENGINES AND TURBINES. Sydney F. Walker. Pp. 410; illustrated. 5½x9 in.; cloth, 9s. London and New York, 1908: Harper & Brothers.

Contents: Introductory. Boilers. Boiler accessories. The steam engine. The steam turbine. Condensing plant.

STATISTICAL ABSTRACT OF THE UNITED STATES, THIRTEENTH NUMBER, 1907. Prepared by the Bureau of Statistics, under the direction of the Secretary of Commerce and Labor. Department of Commerce and Labor. Pp. 763. 6x9¼ in.; cloth. Washington, 1908: Government Printing Office.

THE GAS ENGINE. Frederick Remsen Hutton. Pp. 562; illustrated. 6x9 in.; cloth, $5. New York, 1908: John Wiley & Sons; London, Chapman & Hall, Ltd.

Contents: Introduction. Liberation of heat energy. Combustion. Mechanical energy from expansion of gas and air. The heat-engine cycle. Gas engines burning gas. Gas engines using kerosene oil. Gas engines using gasolene. Automobile engines. Alcohol engines. Proportioning of mixtures. Carburation and carbureters. Ignition. Governing. The cooling of the cylinder. The combustion chamber and the exhaust. Manipulation of gas engines. The performance of gas engines by test. Theoretical analysis of the gas engine. Internal-combustion engines with heating at constant pressure. Experiments on explosive mixtures. Costs of operation. Conclusion.

WASHING AND COKING TESTS OF COAL AND CUPOLA TESTS OF COKE, CONDUCTED BY THE UNITED STATES FUEL-TESTING PLANT AT ST. LOUIS, MO., JANUARY 1, 1905, TO JUNE 30, 1907. By Richard Moldenke, A. W. Belden and G. R. Delamater, with introduction by J. A. Holmes. Bulletin No. 336, U. S. Geological Survey. Pp. 76. 6x9 in.; paper. Washington, D. C., 1908: Government Printing Office.

Questions and Answers

Inquiries for information are answered in this department as promptly as possible, but more or less delay is often unavoidable. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is conceived to justify the expenditure of the time required. Correspondents should refrain from asking for advice that ought to be obtained by professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely.

THE PERIODIC LAW

In a recent editorial in the JOURNAL, reference was made to the metal calcium as being a first cousin of zinc, and magnesium an even nearer relative. Will you inform me just what was meant by this?

M. E. B.

Many years ago the eminent chemists, Newlands, Lothar-Meyer, and chief of all, Mendelèef, developed the theory of a relationship among the elements, and Mendelèef formulated what is called the periodic law, which is briefly expressed by the statement that the properties of the elements are functions of their atomic weights. The development of this theory led to the grouping of elements with analogous properties. In these groupings there were numerous gaps, to fill some of which Mendelèef predicted the subsequent discovery of certain new elements, of which he described the probable properties. Within a few years his predictions were fulfilled by the discoveries of the elements now known as gallium, scandium and germanium. This was a spectacular demonstration of the substantial accuracy of the periodic law.

According to the periodic arrangement of the elements by Mendelèef zinc is classified in Group II, corresponding to the symbol RO, the series in the order of atomic weights consisting of beryllium (9.1), magnesium (24.36), calcium (40), zinc (65.4), strontium (87.68), cadmium (112.3), barium (137.43), erbium (166) and mercury (200). An arrangement of these elements in a form which more clearly shows their connection, was given by Prof. T. W. Richards in the *Proceedings of the American Academy of Arts and Sciences*, March 8, 1898, and the *American Chemical Journal*, 1898, XX, vii, as follows:

H	Be	Mg	Ca	Sr	Ba	....
1.01	9.1	24.36	40	87.68	137.43	
			Zn	Cd	.....	Hg
			65.4	112.3		200

The similarity of the properties of calcium, strontium and barium is well known; also the similarity of those of zinc and cadmium. Take, for example, the reducibility of the oxides by carbon. Mercury, which has the highest atomic weight, is most easily reducible; cadmium is reduced at a higher temperature, viz, about 850 deg. C.; the reduction temperature of zinc oxide is in the neighborhood of 1100 deg. C. The properties of magnesium resemble those of both zinc and calcium. Following out the comparison among the reduction temperatures of the oxides, it has lately been discovered that magnesium oxide is directly reducible by carbon, but the temperature at which the reaction takes place is 1700 deg. C. Similar progressions are observable in other properties of these metals, both physical and chemical. This was why we referred to calcium as a first cousin of zinc and to magnesium as a nearer relative.

PRODUCTION OF COPPER BY EASTERN SMELTERS

In the JOURNAL of May 23, in the editorial presenting the revised statistics of copper production in the United States in 1907, it is stated that the output of four smelters on the Atlantic coast was only 13,640,930 lb. Surely the production of those large and important works must have been greater than that.

F. F. Z.

Our correspondent is quite right. The figures stated, namely, 13,640,930 lb., represented only their production of copper from domestic ore and matte.

The country rock of the Cœur d'Alene consists of slates, greywackes, and quartzite, thrown into east and west folds. In these rocks are fissure veins, in which argentiferous galena is associated with large quantities of siderite, together with some blende and pyrite. The gangue of the ore is quartz. In some veins the minerals are well segregated in individual streaks, the galena, for example, forming seams containing 60 to 80 per cent. lead. In other veins, or in other parts of the same vein, the various minerals are intimately mixed. The orebodies are very large, some of them containing millions of tons of ore.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Francis Church Lincoln, of New York, has gone to Nevada to examine some mines.

Dr. James Douglas sailed for Europe on June 17. He expects to return in September.

W. S. Pearson has been appointed superintendent of the United States assay office at Charlotte, N. C., to succeed D. Kirby Pope.

J. Parke Channing, of New York, has gone to the West on a general trip of inspection, which will probably occupy him about six weeks.

T. Skewes Saunders is now superintendent of the Teziutlan Copper Mining and Smelting Company's mine at Ejutla, Oaxaca, Mexico.

Melbourne Bailey, manager of the Cariboo Consolidated (1904), Ltd., has returned to Barkerville, B. C., from Tacoma, Wash., where he spent part of the winter.

Alexander Leggat has resigned his position as city engineer of Butte, Mont., and has resumed practice as mining engineer, with office in the Hirbour building, Butte.

O. B. Perry, general manager of the Guggenheim companies operating in Yukon Territory, arrived at Vancouver, B. C., from New York on June 1. He left for Dawson a few days later.

Hon. Richard McBride, premier and minister of mines for British Columbia, lately visited several of the larger mining and smelting centers in the Boundary and Kootenay districts of the province.

F. F. Colcord, who has been chief chemist for the American Smelting and Refining Company, at Maurer, N. J., has resigned his position with that company in order to go with the United States Metals Refining Company, at Chrome, N. J.

W. R. Elliott, formerly chief engineer of construction for the H. C. Frick Coke Company, with headquarters at Scottdale, Penn., has opened an office in Denver, Colo., for the purpose of carrying on a general engineering business for the equipment of coal and coke works.

W. W. Leach, of Ottawa, geologist on the staff of the Mines Branch of the Department of Mines of Canada, has gone to the Bulkley and Babine sections of the Skeena mining division, British Columbia, to continue the geological work in which he was engaged during the seasons of 1906 and 1907.

H. Lipson Hancock, general manager of the Wallaroo & Moonta Mining and Smelting Company, of Australia, was a visitor in New York this week, on his way to Europe. He has been in the United States for some time, visiting several of the mining and metallurgical districts of the West.

William Fleet Robertson, provincial mineralogist for British Columbia, left Victoria on June 4 for the Findlay river country, in the northern part of the province, where reported discoveries of placer gold on creeks tributary to the Findlay are attracting attention. He expects to return to Victoria early in September.

C. S. Herzig, who for three years was Bewick, Moreing & Company's representative in eastern Australia, and for the past two years has been engineer in their London office, has resigned his position with that firm, and will open offices as consulting mining and metallurgical engineer at No. 4 Copthall avenue, London.

Dr. J. Bonsall Porter, professor of mining at McGill University, is in British Columbia, where he is visiting mining camps. J. W. Bell, assistant professor, has been with Dr. Porter, directing the studies of some 30 students comprising the McGill Summer Mining School, which has just completed its tour in the West.

Obituary

Charles F. Moore, a recent graduate of the Colorado School of Mines and son of Charles J. Moore, a well known mining engineer, of Denver, was killed June 7 by falling down a shaft in the Portland mine at Victor, Colorado.

Jonathan S. Haselton died in Rome, N. Y., June 15, aged 60 years. He was born in Lawrence, Mass., but went to Rome when a boy, and gradually became prominent in business there. He was president of the Rome Brass and Copper Company, one of the largest plants of its kind in the country, and was identified with other industries which he had been mainly instrumental in establishing.

Caleb Wick, who died at Youngstown, Ohio, June 3, aged 73 years, was for many years engaged in iron manufacture in the Mahoning valley, in which his entire life was passed. More than 50 years ago he became interested in the iron and steel manufacturing business with the late Peter L. Kimberly. As a partner in the firm of Wick, Ridgeway & Co., he was a pioneer in the rolling of iron rails, doing a profitable business until the introduction of steel rails. The old Wick-Ridgeway mill is now a part of the Mahoning valley plant of the Republic Iron and Steel Company, at Youngstown. He was also interested in the development of the bituminous coal industry in both Pennsylvania and Ohio.

Quincy A. Shaw died at his residence at Jamaica Plain, Mass., June 12. He was born in Boston in 1825, and graduated from Harvard University 20 years later. After traveling abroad for several years he became a banker in Boston, in partnership with his father. He was one of the first Boston men to become interested in the Lake Superior copper region. He was one of the promoters of the Calumet & Hecla Copper Company, was the first president of the company, and had been connected with its management ever since as a director and vice-president. He was interested in many other mining enterprises at the Lake and elsewhere. He retired from active work some years ago, leaving the conduct of his enterprises to his son, Quincy A. Shaw, Jr. Mr. Shaw married Pauline, daughter of Prof. Louis Agassiz. She survives him, with two sons and two daughters.

Societies and Technical Schools

Coal Mining Institute of America—The summer meeting was held at Greensburg, Penn., June 18 and 19. President B. F. Jones occupied the chair. The committee in charge of the meeting was Clay F. Lynch, Thomas S. Jamison, H. F. Bovard and Chauncey B. Ross. The morning session of the first day was devoted to business matters, and the afternoon session was taken up principally by the president's address.

The following papers were read during the session of the institute:

"Recent Mine Explosions and Their Lessons." Thomas K. Adams, Mercer, Penn.

"Coal Dust as a Factor in Mine Explosions." Dr. Henry Mace Payne, Morgantown, W. Va.

"Something About Coal." Baird Halberstadt, Pottsville, Penn. This address was illustrated by stereopticon.

"Blasting Explosives for Coal Mines." Dr. A. M. Comey, Wilmington, Del. This address was illustrated by stereopticon views.

Construction News

English, West Virginia—The Flat Top Coal Mining Company is preparing to open a coal mine. J. G. Thomas, English, W. Va., is superintendent.

Duenweg, Missouri—A new concentrating mill is to be erected, to replace the Greenhorn mill, recently destroyed by fire. W. W. Lair and C. H. Finch, Aledo, Ill., are owners.

Shinnston, West Virginia—The Haywood Coal Mining Company is preparing to open a mine and to install electric power and haulage system. R. S. Monroe, Fairmont, W. Va., is general manager.

Las Vegas, Nevada—The Utah-Nevada Plaster and Cement Company will erect a mill. Secretary of State Charles S. Tingey, of Utah, is interested with a number of other prominent Salt Lake citizens in the enterprise.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Goldfield, Butte, Salt Lake City, Denver, San Francisco and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

June 10—In the little Panoche district, west of Mendota, Fresno county, new and important discoveries of oil have been made in the past few months. Those who have made locations have great hopes of developing another oilfield similar to that at Coalinga in the same county. In fact, some of them think that the new district will even excel Coalinga. Oil has also recently been found at Clovis, which is 10 miles west of Fresno, and it is of high grade. Fresno men have organized a company with holdings at Kern, which extend to the Midway field. The oil industry of this State is constantly increasing in importance and the value of the annual yield is now second only to that of gold. The oilfields are confined to the valley region and the coast south of Monterey, little or nothing thus far having been found north of Sacramento, though much prospecting has been done. Just at present the productive Santa Barbara county fields are attracting the most attention, though by far the larger proportion of the annual oil product is derived from the important fields in Kern county, in the San Joaquin valley region.

In Yuba county, the Bay Counties Power Company has a large plant at Colgate on the Yuba river, near Dobbins. Now the Western Power Company is taking preliminary steps to install another large electrical power plant in the same county. The plan is to take water from the Yuba river near Goodyear Bar in a 25-mile ditch to Pittsburg Hill, where the plant will be located. The line of the ditch is now being surveyed.

Active work has commenced on the new 40-mile power line of the Northern California Power Company from Palo Cedro to Kennett, Shasta county. There are already two power lines of the same company carried into this smelter town. The Mammoth Copper Company uses most of that already supplied, and there are demands from other mining companies for more. The new line will carry 60,000 volts.

The old mining camps around Havilah, in the Piute mountains of Kern county, discovered originally in 1860, are again coming to the front after a long period of inactivity. The old Rand Hill mines are to be reopened, as are the mining properties owned by Haggin & Hearst. The Bright Star has been bonded, and the Mammoth and Whitney View mines have both recently put up new mills. The Piute Consolidated Mining Company has also let a contract for a new mill, a fine body of pay ore having been opened up. The tunnel which is to be run will cut the veins at 4000 ft. depth. Few of the old mines were worked below 300 ft. depth.

Since the Arizona Diamond Drill and Prospecting Company finished its drilling contract at Iron Mountain, Shasta county, the Mountain Copper Company has renewed exploration with its own drills. There are two drills now being worked so as to prove the width of the main body of the kidney-shaped formation, at a depth much below the old workings. Shipments of ore are being made from the Hornet mine to the tidewater plant of the company at Bulls Head, near Martinez, Suisun bay.

The Argonaut Mining Company at Jackson, Amador county, for many years a large producer, is now, under a new management, sinking a new prospect shaft 2000 ft. south of the old one, and if the orebody is not struck another shaft will be started.

The old camp of Forbestown, one of the few quartz-mining centers in Butte county, where the Gold Bank mine of the Stow Estate paid largely for years, is again showing some activity. Philadelphia men are reopening the Carlisle mine; an interest in the Hidden Treasure has been purchased by Nevada capitalists; and a tunnel is being run on the Beik property.

The Garden Valley Gold Mining Company has been organized to work the Hume claim at Garden Valley, El Dorado county, and a mill is to be put up. H. H. Hicks is manager. E. J. ("Lucky") Baldwin has returned to this county to resume mining operations at Nashville and Placerville.

The Massachusetts Copper Mining Company, owning the Tom Head copper mines in Tehama county has done nothing there since last fall. Operations are now to be resumed by the company under manager Guyot.

The old Guadalupe quicksilver mines, seven miles from San Jose, and not far from the New Almaden mines, were worked profitably years ago and then became involved in litigation. A few years ago the Century Mining Company was organized to work the property, but water and cave-ins finally made it quit. Then the Davey Mining and Investment Company was organized by H. C. Davey and others and considerable development was done. The interest of the latter company has now been taken over by the New Guadalupe Mining Company, which was organized last December. The new company has been quietly working with a view to commence the actual production of quicksilver this spring. The reservoir has had its capacity so increased that ample water supply is available for an electric plant which will furnish power and light. The reduction plant has been put in good working order.

J. A. Marshall, secretary-treasurer of the Tarr Mining Company redeemed the property of the New Blue Point Mining Company, at Smartsville, Yuba county, which was sold to the State in 1903 on account of delinquent taxes.

The Princess Mining and Milling Company in the Little Tejunga, Los Angeles county, has had rather a chequered career in the past four years, but now McDonald & Co., of Spearfoot, S. D., have agreed to take hold of the property provided they are assured of protection against hampering claims or legal proceedings by creditors. The superintendent of the company, Mr. Clark, in a circular letter to the creditors asks them to give McDonald & Co. time to erect the mill and put it in operation. A 100-ton plant is to be put up.

Salt Lake City

June 13—There is a great congestion of ore at the Garfield smeltery of the American Smelting and Refining Company. The statement is made officially that there are at least 30,000 tons piled up around the yards. The company has experienced a great deal of trouble since the Garfield plant was placed in commission, but the difficulties are being rapidly overcome. The taking on of new contracts has greatly increased the tonnage coming to the plant and although new equipment has been provided, the capacity is still inadequate. However, another blast furnace will be blown in next week, a second within three weeks and a third in six weeks, making nine furnaces in all in operation and providing facilities to handle 2700 tons of ore and flux daily.

Articles of incorporation of the Raven Mining Company, a New Jersey corporation, have been filed in Utah with a capital stock of 20,000 shares, the par value being placed at $100. This company's predecessor has a history. The old corporation came into legal existence in Utah, Sept. 6, 1898, and a number of prominent Utah men were concerned; the basis was large tracts of gilsonite and elaterite deposits situated in eastern Utah and western Colorado, located on unsurveyed lands of the Uintah Indian reservation. Through negotiations with the Indians no serious objection was regis-

tered against the company's entering the reservation to operate its mines; but the company achieved considerable notoriety about the time the bill was introduced in Congress providing for the opening of the reservation to settlers. The Raven company seemed to have much influence about that time on members of Congress and as a result the opening was greatly delayed, the bill having been opposed until clauses were inserted giving the company first right to practically all the valuable elaterite and gilsonite deposits on the reserve. Men at the head of the enterprise, it was charged, had weeded out minority shareholders, and sought to control thousands of acres of valuable lands in the hydro-carbon regions of the State without being obliged to pay a large consideration therefor. The president of the new company is Charles F. Pfister, of Wisconsin, and it is stated that Senator Quarles and other men of his State, with Mr. Pfister, own a controlling interest in the enterprise.

Goldfield, Nevada

June 9—Senator Clark and party visited Goldfield this week to make a study of local conditions relative to a reduction in transportation rates on ore, also in reference to building a spur from Cuprite to Hornsilver. The conclusions were not divulged, but everything seems to indicate action in Goldfield's favor.

W. E. Mitchell, who has been sponsor for a half dozen unsuccessful Goldfield prospects, has been sued for $18,000 by Wm. Bayly, of Los Angeles, Cal., for alleged misuse of funds and stock. Also a committee of eastern investors has been appointed to investigate Mitchell's schemes into which they have been drawn.

The Mohawk Combination Leasing Company made a new record for the camp by extracting $69,750 from its lease during the four days allowed by the arbitrators. The first bucket of ore was hoisted just 20 min. after the start, and $22,000 worth of ore was taken out the first day. The "graveyard" shift, the last day, hoisted 169 mine cars of ore.

The Nye & Ormsby County Bank, which closed its doors last fall, has paid thus far to its depositors 84 per cent. Its business has this week been taken over by the First National Bank, which will formally wind up the affairs of the defunct concern. It is expected to return to the depositors the other 16 per cent.

Butte

June 11—The unprecedented rainfall obtaining throughout the State during the last two weeks has seriously affected the mining industry in and around the city. Practically all of the mines in the district have curtailed their output and several are shut down altogether. Last week the dam near the Boston & Montana smelter at Great Falls was carried away by the high water and the power house and lower works were flooded. It is estimated that it will take over three weeks to repair the damage, but the exact result of the flood has not yet been determined. The tracks of the Great Northern railway, connecting Butte with Great Falls, were also considerably damaged, and it may take a week to place them in condition for the resumption of traffic. As a result, the mines of the Boston & Montana company were closed down for several days, and even those which are now operating are unable to ship ore and must of necessity confine themselves to development work.

The Anaconda, Washoe, North Butte and Red Metal companies, which ship their ores to the Washoe smelter at Anaconda, were also affected, the railway between Butte and Anaconda having been put out of commission by washouts. This road, however, will be ready for traffic in another day or so. The Washoe smelter itself was not affected, and there is enough ore on hand to enable the smelter to continue operations until the regular shipments from Butte commence.

The Butte Reduction Works, owned by Senator Clark, and treating the ores from his properties, escaped without injury.

Denver

June 12—As the result of the probable extension of the Newhouse tunnel another 5000 ft., and the remarkable strike of rich gold ore in the War Dance claim, near Central City, a marked revival in the Gilpin county mines has been inaugurated. The War Dance discovery is a somewhat singular story, inasmuch as the claim was owned by a company incorporated in 1880, but operations on the mine, which were very limited, ceased; the incorporation, which was for 20 years, ran out, and one by one the directors passed away until only two were left. One of these, who owned 90 per cent. of the stock, granted a lease on the property, and the leasers made a discovery of ore which ran about $700 per ton for first-class, and $75 to $150 for the rest, the streak being from 5 to 12 in. in width. The ore is calaverite in a fluorine-stained matrix of what is apparently an altered granite.

The inevitable claimant and litigant also promptly cropped up in the person of the director who owned the other 10 per cent. of the stock, and who has got out an injunction and stopped the extraction of ore. As compared with the average ore of the district, which is auriferous pyrite, this may be called "freak ore." However, whether it proves permanent or not, the strike has set everyone in the vicinity digging, and so good has been accomplished. The old Notaway mine, near-by, has some of the same kind of ore.

The Central Colorado Power Company is pushing its transmission line from the plant near Glenwood Springs to Denver, and it is claimed that power will be available here by November. Work at the Gore cañon plant, which ceased at the time of the closing of the Knickerbocker Trust Company, where the funds were deposited, still remains shut down.

Jacob Wallace and others have entered suit against the United Oil Company, the Inland Oil Company, the Continental Oil Company, and the Standard Oil Company for the recovery of $1,000,000 which it is asserted has been diverted from the use of the complainants by the Standard Oil Company, operating through the agency of the Continental Oil Company, which, the complainant alleges, is a subsidiary organization of the former. An accounting and a receiver is asked for pending the settlement of the suit.

The usual number of strikes of ore in the Cripple Creek district, and a constantly increasing activity in all the mining camps of the State are reported.

A claimant to many mining claims on Fryer and Iron hills, in the Leadville district, has appeared in the person of a niece of the noted Pat Casey, who died in 1880, after spending in dissipation the large fortune he made in the mines. But at the time of his death, he owned many mining properties which, as no relatives could then be found, reverted to others.

Toronto

June 12—In the trial of the action of the Florence Mining Company against the Cobalt Lake Mining Company involving the title of the latter company to the bed of Cobalt lake, for which it paid $1,085,000 to the Ontario government, Judge Riddell held that it had been clearly shown that the Florence Mining Company had made a discovery which under the mining law entitled it to record a claim, but he was inclined to hold that the act, subsequently passed, confirming the title of the Cobalt Lake company had taken away this right. The fact that the action was pending at the time of this legislation made no difference in the law. However, he stated that he would reserve judgment, but unless he saw reason to change his mind, he would decide for the defendants.

A party of prominent American capitalists, interested in iron and steel industries, recently made an inspection of the Moose mountain iron-ore deposits north of Sudbury, Ont. The visitors included John W. Gates and J. F. Harris, of New York; C. H. McCullough, president of the Lackawanna Iron and Steel Company; John Lambert, president of the American Steel and Wire Company; J. J. Mitchell, president of the Illinois Trust and Savings Company; P. W. Ogilvie and Leonard Millar, of Chicago; J. C. Hastings, Illinois Trust Company, and Joseph Sellwood, Duluth. D. D. Mann, of the Mackenzie & Mann Company, Toronto, accompanied the party. Shipments are expected to begin next month, all that is needed being the completion of the docks and ore-handling facilities at Key Harbor on the Georgian bay.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

BIBB COUNTY

The Cahaba field commercial coal operators who have been operating with union miners, notified all their employees June 1 to vacate their dwellings July 1, on which date the contract with the United Mine Workers expires. This move is preparatory to running on the open-shop plan unless the mine workers accept a reduction of 10c. per ton in the mining price and about 15 per cent. in the day-wage scale, with same conditions as non-union mines. There are about eight coal operators in this movement.

JEFFERSON COUNTY

Pratt Consolidated Coal Company—This company has started up several of its mines which have been idle for some months past.

Sloss-Sheffield Steel and Iron Company—This company has started up its Birmingham furnaces and coke ovens; also several idle mines and washers in the Pratt field.

Tennessee Coal, Iron and Railroad Company—This company is resuming operations at the Ensley steel works and rolling mill; at two additional Ensley furnaces, making four in operation at that plant; at Alice furnace in Birmingham, and a furnace at Robertstown, making two at that plant. It has also started up 984 coke ovens, five coal washers and six coal mines in the Pratt field, besides putting two mines on full time which have been on half time.

Arkansas

MARION COUNTY

Coker Hollow—The lease on this tract has been sold to parties from Pittsburg, Kan., who will begin mining zinc ore soon.

Arizona

COCHISE COUNTY

Copper Queen Consolidated—With the exception of the final connections the installation underground of eight of the new Aldrich vertical triplex electric pumps has been completed. They are to be driven by alternating-current motors; the current for the larger motors to be transmitted under high tension, and there transformed to 220 volts. For the smaller motors the current will be transformed at the surface. On the Czar 400-ft. level there are three 300-gal. pumps with motors of 50 h.p. each, and one 50-gal. pump to handle the small proportion of water that is practically free from acid, and is used in the boilers. On the Holbrook 500-ft. level the two pumps have 100 gal. per min. capacity and 10-h.p. motors, the water being raised only 100 ft. The Spray pumps of which there are two with 50 gal. capacity each, and driven by 20-h.p. motors, are on the 900-ft. level. The pumps are equipped with special acid-resisting valves and the water columns are wood lined. In development work the completion of the long connection drift between the Lowell shaft and the Sacramento on the 1200-ft. level brings the new underground haulage system one step nearer to completion. At the Lowell mines energy is being devoted to the development of the 1300-ft. level, this being at present the deepest level in the mine. The results have been fairly satisfactory thus far. In the northern part of the Queen property, near the Czar shaft, two discoveries of oxide ore of good grade have recently been made. The Uncle Sam shaft has reached a depth of 550 ft., and is being pushed downward through a dark broken limestone. No indications of ore have appeared as yet, although it is expected the shaft may soon cut through the mass of low-grade sulphide ore which was found a few months ago on the main Czar 200-ft. level below. The Queen is shipping sulphides to the Old Dominion smelter, at Globe. At Douglas six out of the ten furnaces are in blast handling daily about 1500 tons of ore from the Queen mines, 125 to 150 tons of concentrates from Nacozari, and a small amount of custom ore from Mexico and Arizona.

Superior & Pittsburg—Up to the present 60 ft. of sulphide ore has been cut on the 1300-ft. Hoatson. The first body was broken off by pyritic limestone after 45 ft. had been passed through, but 25 ft. further on in the same crosscut, a second body has been encountered and has been drifted in 15 ft. The cutting of a station on the same level, and the installation of a direct-connected tandem compound Prescott pump have been completed. Sinking to the 1400-ft. level has been resumed.

Calumet & Arizona—The smeltery at Douglas is running about to the limit of its capacity. During the month of May the daily average was 1450 tons of ore with a total copper production of a little more than 4,000,000 pounds.

GRAHAM COUNTY

Arizona Copper Company, Ltd.—Production for the month of May amounted to 1551 tons of copper.

GILA COUNTY

Miami—Before starting West June 13, J. Parke Channing, consulting engineer, addressed the following letter to the president of the company, Adolph Lewisohn:

"My report, as published in the prospectus, was written practically as of March last. Since that time developments have been actively pushed and the tonnage has been rapidly increasing, so that I think by the first of July, at which time I shall arrive at the mine, I will see at least 5,000,000 tons of ore in sight. There is very nearly that amount now, and so far, all the drifts which we were operating last April, have continued in ore.

"The Miami promises to be a very large copper producer. The grade of the ore holds up remarkably well. The results of recent samplings show that it is fully 3 per cent. We have completed our line of experiments to determine the details of the mill construction and the design of this mill will now be pushed to a conclusion. I am informed that the extension of the railroad will be begun by the railroad company on July 1, and should reach us in time to bring in the major portion of our construction material.

"The compact and enormous size of the orebody more than ever confirms me as to my estimates of low costs of operation. The proximity to water and rail transportation will enable us to begin producing much more rapidly than those properties which are handicapped in this direction. I must say that since the discovery of the mines of the Nevada Consolidated at Ely, there has been nothing as large and promising as the Miami."

California

BUTTE COUNTY

Butte Creek Consolidated—The necessary machinery for a large dredge has been ordered in the East for this company's property on Butte creek, and it is expected that the dredge will be at work by October.

Gordon Graham—Having a good supply of water, this mine is handling large quantities of gravel, the yield from which is reported as unusually great.

CALAVERAS COUNTY

Hamby—Operations are to be resumed at this mine, between Mokelumne Hill and Paloma. The mine is equipped with both electric and steam power and has a 20-stamp mill, hoist, etc. The three-compartment shaft is 200 ft. deep.

Mechanics' Mining Company—This new company has been organized by 25 mechanics in Oakland, Cal., to work the Ritter mine, seven miles from San Andreas. The mine is a very old one, but has never been worked systematically.

EL DORADO COUNTY

Delwisch—This is one of the "seam diggings" properties near Georgetown, and is owned by Fowler Brothers. They have leased the Barklage ditch and will sluice down the side of the hill and gather the gold in sluice boxes.

Standard Unit—This mine at Greenwood has been started up with a full crew of men.

Woodside Eureka—The work of unwatering the old Eureka shaft will shortly commence, enough money having been raised to carry out the plans. The mine is at Georgetown and is well equipped.

INYO COUNTY

Thompson-Briggs—On this property at the new gold camp of Kruger, four miles south of Keeler, six sets of leasers are now at work.

LAKE COUNTY

Rocky Creek Quicksilver Mining Company—This company has been organized at Napa, with G. P. Swift as president and A. J. Harrington as secretary, to work two quicksilver claims on Rocky creek on the southeast corner of Lake county, not far from the Napa and Yolo county boundary lines. The property formerly belonged to Swift Brothers.

NEVADA COUNTY

Ancho—At this mine, Graniteville, H. W. Overman, manager, the first clean-up of the 10-stamp mill has resulted satisfactorily.

Cotton Hill—This gravel mine on Washington ridge is being reopened by the owners, L. Damon and A. Schlatter. There is a six-stamp mill at the mine.

Midas—Operations at this mine have been resumed under superintendence of Herbert James.

Western Development Company—This company, C. E. Carter, manager, which has had the Giant King mine at Washington under bond for some time, has finally bought it. The ledge is a wide one, though the mill at present on the property has only five stamps.

SAN BERNARDINO COUNTY

Hart—At this new camp the Hart Gold Mining Company has been organized to develop the Red Mills and Gray Horse groups. The Swan lease is still holding the lead as the best one so far. The Oro Belle Mining Company is about to start a tunnel and a deep shaft. The tunnel being driven by Hart & Hill on Oro Belle No. 1 has run into rich stringers of high-grade ore.

Ord Mountain—This company, Geo. Hasson, of Los Angeles, president, which owns mines 11 miles from Daggett, has been developing for the past 18 months, and has some 2000 tons of ore on the dump. A 10-stamp mill has been shipped, which will be erected at once.

Colorado

LAKE COUNTY—LEADVILLE

Ballard—Arrangements are under way for resumption of work on this well known gold producer, Breece hill. Unfortunately for the owners and for the district the property has been tied up for the past two years in litigation which it is expected will be settled shortly. When this is accomplished the mine will be worked. In several of the levels there are good bodies of bismuth ore. In the property there is also a body of silicious gold ore.

Catawba—The recent strike made in this property, Little Evans gulch, continues to improve with development, both in quality and quantity. Shipments will be started soon.

Gambetta—Lessees on this property, California gulch, have opened a good looking body of lead-sand ore with every prospect that it will lead to a large orebody. The vein at present is 3 ft. wide, and as work proceeds it widens; the ore runs well in silver, with a heavy percentage of lead.

Ida May—At this mine, in the Lake Park Creek district, at a depth of 13 ft. from the surface a 6-ft. vein of ore has been opened. The ore will average $15 per ton. The vein is a fissure, carrying gold, silver and copper.

Matchless—Thomas M. Raney and associates have secured a lease on this property, Fryer hill, from Mrs. Tabor, and work underground will be started shortly. At present the surface plant is being overhauled and put into working order.

Penrose and Midas—Lessees are shipping a good grade of iron from these properties in the downtown section, and carrying on considerable prospecting in new territory.

Starr—This property, Lower Carbonate hill, has been under lease for several months past to Nicholson Brothers, and shipments of a good grade of iron have been more or less regular. About three weeks ago a small streak of rich iron ore was found and followed, with the results that a good body of first-class ore has been opened, carrying chlorides. The ore was opened at the 550-ft. level in an upraise 400 ft. from the shaft. Some of it will run very high in silver; the average of the whole horizon will go between 35 and 40 oz. silver, with a small percentage of lead. At present a station is being cut at the 550-ft. level to facilitate the handling of the ore. Shipments will start this week.

SAN JUAN COUNTY

May shipments of ores and concentrates from Silverton are reported as follows: Silver Lake, 2100 tons; Gold King, 2000; Hercules, 575; Sunnyside, 250; Old Hundred, 50; Hamlet, 50; total, 5025 tons.

Gold King—The accounts received from this mine at Gladstone last week stated that no one had been killed in the fire at the mine on June 5. Later accounts, however, report a loss of six lives, while eight men were seriously injured, but will probably recover. On the night of June 5 it was believed that all the men in the mine had escaped, but later it was discovered that three were still in the tunnel. A rescue party of 30 was organized and succeeded in finding the missing men on the fifth level. Before they could return to the shaft, however, six were suffocated by the gases resulting from the fire and the stoppage of all ventilation, and eight others were brought up in a critical condition. All of the rescue party suffered in some degree.

Connecticut

LITCHFIELD COUNTY

Kent Iron Company—The iron mine property of this company at South Kent, including 800 acres of land, will be sold June 27 at public sale, to close up the company's business. The mine has not been operated for some years. Iron ore was mined there for over 100 years, being converted into pig iron at Kent furnace, four miles distant.

Idaho

IDAHO COUNTY

Mount Marshall—Arrangements are being made for supplies and a crew of 20 men, and operations will begin soon. The stamp mill which is being built at the property is expected to be in operation by Aug. 1.

Crackerjack—This mine will be sold at sheriff's sale on June 20. The mine contains large bodies of low-grade gold ore and has been extensively developed. Recently an effort on the part of a number of stockholders to save the property by pooling fell through, and it is thought the sheriff's sale will take place.

LEMHI COUNTY

It is reported that work will be started some time this summer on the railroad which will penetrate the Lemhi country, the initial point of the new road being at a point on the Oregon Short Line in northern Montana. The completion of this railroad will open up a country which has long been exploited for copper, gold and silver, but which has always been handicapped by lack of transportation facilities.

SHOSHONE COUNTY

Black Horse—This mine is now being developed by three shifts driving on the No. 3 adit. Manager Burke states that the adit is now into the hill 325 ft. and that progress is rapid. There are 3000 ft. of development above the No. 3 adit, which will tap the orebodies at 1200 ft. below the outcroppings and give a railway level working tunnel.

Rainbow—This property, situated in Shield's gulch of the Cœur d'Alenes, reports striking rich sulphide copper ores recently. Work is in progress on an adit which has now pierced the hill 250 ft. and will require to be driven 150 ft. more to reach the vein.

Monitor—It is expected that work will soon start on this mine, near Saltese. The mine was recently bonded to a company headed by H. F. Samuels and J. L. Bailor, both connected with the Success Mining Company. The mine is equipped with two boilers, air compressor, hoist and pumps.

Guelph Mining Company—The crosscut being run on this property has now been extended over 600 ft. and according to surveys, has passed beneath the apex of the orebody 46 ft. Owing to the dip of the vein, it is expected that it will be encountered soon.

Cedar Creek Mining and Milling Company—It is reported that galena of concentrating grade has been struck in the face of the adit, 490 ft. from the portal, and at a depth of 350 ft. The main adit has been driven about 1300 ft. giving a depth of 800 feet.

Colusa Mining Company—This is a new corporation recently organized to work a group of claims near Gem. The incorporators are: E. M. Suiter, Benjamin Frick, J. F. Moore, J. G. Benson, and John H. Wourms.

KOOTENAI COUNTY

Midas—The new steam compressor was put in operation June 2, and it is expected that the mine will be under development with three shifts within a short time. Sixty men are now employed in and around the mine. Other mines of the district are also active.

Illinois

Under the new mining law, coal miners will be required to hold certificates of competency issued by an examining board, as is the rule in Pennsylvania. It is said that it will be difficult or impossible for all the miners to secure such certificates before the law takes effect.

Missouri

ZINC-LEAD DISTRICT

Owing to heavy rain during the week ending June 13, the general water level in the mines in the Joplin district was raised at least 7 in. Mines that were operated a year ago without pumps are now pumping 24 hours every day. One Carterville company reports that it is pumping 1000 gal. per min. where it was pumping a maximum of 90 gal. a year ago. Water encroachments become more evident every week, and it is estimated that the water level in undrained and abandoned mines and drifts is 10 ft. higher than a year ago. Heavy wind and rain June 12 washed out reserve ponds, tore down smoke stacks and elevators from one end to the other of the district.

Montana

BUTTE DISTRICT

Red Metal—More than 25,000 tons of ore were produced from the Rarus mine alone during the month of May. This amount does not include the ore mined by the Rarus jointly with the Pennsylvania. Sinking on the Rarus shaft, which is now below the 1800, has been discontinued and a crosscut is being driven to the vein. At the Tramway mine the sinking of the shaft is being continued, a depth of nearly 1500 ft. having been reached. Crosscuts are being run on the 1300 and 1400 levels into the adjoining Minnie Healy ground and drifts extended. A 20x72-in. engine which was formerly used as hoisting engine at the Minnie Healy, is now operating at the Tramway shaft. The new 32x72-in. hoisting engine is completed, however, and will be installed as soon as the Minnie Healy and Tramway orebodies are opened up.

Davis-Daly—Leasers are shipping considerable high-grade ore from the Silver King, one of the properties of this company.

Reins—It is reported that operations are soon to be resumed on this property. The claims of the company are in the midst of the Boston & Montana group and adjoin some of the largest producers in the camp. The shaft is now down 1200 ft. Considerable development work has been done, though the more recently acquired claims of the company are, as yet, far from being thoroughly explored.

North Butte—A new high record is being made each month in ore production from this property. During May over 45,000 tons were shipped, half of which was first class. Stations are being cut on the 2000- and 2200-ft. levels, which will give 400 ft. of new ground below the 1800, now the lowest level from which ore is being extracted. Both the 2000 and 2200 levels will be brought into production within a few months, as the Edith May vein is very close to the shaft at those points. A quarterly dividend of $1 per share has been declared, payable June 27.

British-Butte—Three dams on the property have been washed out by the recent heavy rains, and are now being repaired. These dams were recently built for storing the water pumped out of the mine, which is to be used for dredging purposes.

North Butte Extension—This property is temporarily closed down, pending the settlement of litigation.

MEAGHER COUNTY

Copperopolis—The mine is being worked by leasers. The original shaft was abandoned at a depth of 600 ft., where the orebody was lost. A new shaft has been sunk to the depth of 75 ft., and from there drifts have been run in an easterly and westerly direction a distance of 100 ft., exposing a vein 4 ft. wide. The ore is cuprite, averaging 5 per cent. and carrying as high as 30 per cent. copper. The ore which is now being shipped has to be sorted, since the cost of hauling to the railroad makes unprofitable the shipment of anything running below 15 per cent.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Output—The production for the week ending June 8 was 2407 tons valued at $188,759, as follows: Combination, 595 tons; Kendall lease, 150 tons; Wingfield dump on Florence, 229 tons; Van Riper dump, 82 tons; Rogers Syndicate, 469 tons; Mohawk Combination Lease, 120 tons; Gem, 29 tons; Engineers' Lease, 68 tons; Daisy, 35 tons; Jumbo, 270 tons; Mushett, 88 tons; Sandstorm, 95 tons; Victor, 28 tons; Knickerbocker-Curtis, 50 tons; Waterman Lease, 9 tons; Black Butte, 9 tons; Combination Fraction, 30 tons; Begole Syndicate, 30 tons. The Florence Annex shipped one-quarter of a ton which sampled $1820.

Florence Leasing and Mining—J. C. Hanna has filed a suit for $1061, and has placed an attachment on the available assets of the company for wages alleged to be due him when the lease shut down a few days ago.

Rogers Syndicate Lease—This lease on the Red King of the Florence ran into a pocket of high-grade ore this week which was sacked and placed in Cook's bank. The lease is shipping about 50 tons of $100-ore every day, without sorting. The lease runs until July 11.

Victor—The Victor Mining and Leasing Company, in driving an upraise, struck a 6-ft. vein which assays as it is broken from $24 to $51 per ton. Shipments have begun.

Red Hill Lease—The lease on the September claim of the Red Hills property has cut a ledge on the 350-ft. level which encourages the management to believe that a pay shoot is not far away.

Gotwalder Combination Mining—This company operating a lease on the Combination No. 2 claim of the consolidated property has opened up what at first sight appears to be an extension of the famous Combination vein. Ore was encountered

at 262 ft., where a station has been cut and drifting will be begun at once. The shaft will be continued to the 300-ft. level.

Diamondfield Black Butte—Ellsworth & Baumgartner, who are leasing on Black Butte in the Diamondfield district, have made an initial shipment this week which ran 21.2 oz. silver and 10.77 oz. gold per ton.

NYE COUNTY—BULLFROG

Montgomery-Shoshone — The total production for May was about $86,000, of which about $50,000 was in bullion and $36,000 in concentrates. The number of tons treated at the mill was 4500, the value of the ore handled being about $20 per ton. A station is being cut on the 700-ft. level in the three-compartment shaft. The shaft will be continued to greater depths.

Homestake—Stoping has begun in the mine and the machinery in the mill is practically ready to run. The compressor plant has been in operation several days. The mill has 25 stamps with machinery for amalgamation, concentration and cyanidation.

Skidoo—The clean-up of the first 12 days' run produced bullion to the value of $7000. Equipment for a cyanide plant has arrived on the ground.

Keane-Wonder—Mill operations have been handicapped by lack of water, but Manager Wilson states that this difficulty has been overcome. The last clean-up covering 10 mill days yielded $9000.

Tramp Consolidated—A force of men is driving the adit another 200 ft. The adit is more than 1000 ft. in, and another 200 ft. will bring the face under the shaft when sinking will be resumed.

NYE COUNTY—TONOPAH

Ore Shipments—Shipments over the Tonopah & Goldfield railroad for the week ending June 6 to the Western Ore Purchasing Company, consisted of 88 tons from the Tonopah Extension. The Tonopah company sent 3450 tons, the Belmont company 700 tons, the Montana-Tonopah 1100 tons, the Jim Butler 170 tons, the Midway 100 tons, and the MacNamara 150 tons to the mills, making the total shipments for the week 5758 tons of an estimated value of $118,680.

MacNamara—The ledge recently encountered on this property has widened to from 4 to 5 ft. of rich ore. Large specimens of crystalline silver sulphide have been found, also ruby silver. Shipments are going forward at the rate of a carload every two days.

Tonopah-Belmont—Arrangements have been made to use the shaft of this company for working the North Star and Rescue properties. The shafts of the two properties will be abandoned. The necessary connections, it is expected, will afford excellent circulation of air through all the properties. Arrangements have also been made to mill all the ore found in the North Star and the Rescue at the Belmont mill. Superintendent Brady of the Belmont will also direct operations in the other two mines.

West End—Rich silver sulphide ore is reported to have been encountered in the bottom of the new shaft which is being sunk 500 ft. west of the old one. The shaft will be continued down 10 ft. more to the 400-ft. level when crosscutting will be done to connect with the west drift from the old shaft.

New Jersey

HUDSON COUNTY

Orford Copper Company—It is officially announced that this company will entirely close down its plant at Constable Hook, N. J., during the month of July, in order to clean all flues and make necessary repairs and adjustments. The present plant has been in operation only a few months and it was thought better to close down entirely for one month than to run half-time as heretofore.

Pennsylvania

ANTHRACITE COAL

The appeals of the coal companies from the increased assessment on their lands, made by the Lackawanna county commissioners came before the court June 15, and are now being heard. Experts Blewitt and Davies, who have been determining the quantity of coal in the county, have finished a report showing that there are 500,000 foot-acres of coal in round numbers in the county, or three times as much unmined coal as has ever been assessed. On all of this coal the commissioners have placed an assessment of $100 a foot-acre, which brings the valuation of all coal in the county up to $50,000,000. From this assessment every company and many owners of small tracts have taken appeals, on the ground that the assessment has been made illegally and for other reasons, among which is that the commissioners have assessed coal and surface separately. Since the appeals were filed, the larger companies and the commissioners' experts have practically agreed as to the quantity of unmined coal owned by each company. The point now disputed is the equity of the rate of assessment.

Temple Iron Company—In the case of the explosion at this company's Mt. Lookout colliery the coroner's jury has found the following verdict:

"We find that George Metcalf and 11 fellow workmen came to their deaths from injuries received from an explosion of gas in the Mt. Lookout colliery of the Temple Iron Company, May 12, 1908.

"The evidence produced shows: First—That the fatal explosion occurred in the middle of the afternoon of the aforesaid day and that several smaller explosions had taken place during the previous 24 hours, the first in the early part of the evening of May 11. Second—That as a result of these smaller explosions the air current had been interfered with and rendered practically inefficient and as a result of this there was a large accumulation of gas, which exploded and caused such a fearful loss of life. Third—That during the night after the first explosion the mine was being looked after by a night watchman and that none of the officials was notified that an explosion or explosions had taken place. Fourth—That about the middle of the day an additional force of men was called into the mine to assist in the work.

"We therefore find that the officals of the said company, namely, George Steele, Gilbert Jones, Robert Whitely and Bernard Holleran erred: First, in not looking more carefully after the ventilation; second, in taking such a large force of men into a section where the danger was so great."

South Carolina

UNION COUNTY

Pacolet Mining Company—This company has acquired several old gold mines near Pacolet, 14 miles from Union, and is preparing to reopen them. W. S. Lipscomb, of Union, S. C., is manager.

Utah

JUAB COUNTY

Tintic Shipments—Five mines in this camp shipped 56 carloads of ore last week, the contributors and amounts being: Bullion Beck, 2; Centennial Eureka, 38; Eureka Hill, 11; May Day, 4; Yankee Consolidated, 1 car.

Tintic Smelter—Such unusual stormy weather prevailed during May that construction work was greatly delayed; but it is anticipated that at least one copper converter will be placed in commission in July.

Gemini—The shaft in this mine has been completed to the 1900-ft. level, which is being explored. No ore shipments have been made for several months owing to the closing of the United States smelter with which the company had a contract.

Sioux Consolidated—What appears to be an extensive orebody has been opened at a depth of 330 ft.; it contains high-grade shipping ore.

SUMMIT COUNTY

Daly-West—This Park City company has resumed production after a shut-down of six months. For a time the mill will be operated only one shift per day.

Ontario—The drain adit is now completely restored and an exploration of the Ontario mine workings for a distance of 1500 ft. from where the last obstruction was removed has disclosed that no serious damage was done through the three years of inundation to which the mine had been subjected.

Uintah Treasure Hill—The manage-

ment has concluded to install a compressor and to push development more rapidly.

Washington

FERRY COUNTY

First Thought Mining Company—This, the only gold-mining company of importance working in Washington, shipped ore from its mine near Orient to the value of $250,000 during the month of April; figures for May are not obtainable yet. The property has been worked for several years by Rossland (B. C.) people, although the offices are in Spokane. The property consists of several claims on First Thought mountain covering an andesite dike, the width of which is not determined. The present workings consist of a tunnel several hundred feet long, and a stope working back toward the hillside, which is 18 ft. high by 30 ft. wide at present. New machinery is to be installed this summer, according to a statement by Blake Wilson, one of the chief owners, and preparations made for working on a large scale.

West Virginia

KANAWHA COUNTY

Jed Coal and Coke Company—Chief Inspector J. W. Paul, of the State Mining Department, has ordered a suspension of work at the Paint Creek mine of this company, on the report of J. G. Boyd, the district inspector, that the company had refused to obey an order requiring the use of safety lamps. The company has appealed to the district court from this order, and a hearing was ordered for June 25, the company being allowed to operate the mine pending a decision

MCDOWELL COUNTY

Flat Top Coal Mining Company—This company has been organized to operate a large tract of coal land recently acquired. It is proposed to open a mine at once and to install a large plant. The office is at English, W. Va. The company has chosen the following officers: W. H. Thomas, president; L. C. Hansbrough, vice-president; O. M. Deyerle, secretary-treasurer, and J. G. Thomas, general superintendent. The coal will be sold through the Flat Top Fuel Company, of Bluefield.

MARION COUNTY

Haywood Coal Mining Company—This company, owned by Pittsburg people, will open a mine near Shinnston, on the Monongah branch of the Baltimore & Ohio. The company owns 124 acres of Pittsburg seam coal, and leases 60 acres more. The mine is to be equipped for an output of 500 tons a day, and is to be supplied with an electric power system. The officers of the new concern are: E. F. Gwynn, Pittsburg, Penn., president; Seymour McIntosh, Fairmont, W. Va., vice-president; H. H. Myers, Pittsburg, secretary; T. M. Chidester, Pittsburg, treasurer; R. S. Monroe, Fairmont, general manager.

PRESTON COUNTY

Hamilton Coal and Coke Company—This company has bought the old Newburg mine, which has not been operated since 1885. A contract has been let to W. F. Patterson, of Pittsburg, to unwater and clean out the mine. Irving Adams, Cumberland, Md., is president of the Hamilton company.

TAYLOR COUNTY

A tract of coal land near Thornton has been sold to B. P. Porter, of Cleveland, Ohio, who purposes developing it and opening a mine. H. A. Lane, Thornton, W. Va., is manager in charge of operations.

Wisconsin

ZINC-LEAD DISTRICT

Benton—A consolidation of a number of producing zinc mines is being negotiated at Benton, with the purpose of erecting a joint ore-separating plant of the galena roast type. The Benton Mining and Developing Company is behind the movement, and for this purpose has increased its capitalization to $600,000 stock.

Linden—Levi W. Pollard's prospect, the Candy Boy, is showing up good sheet jack in a shaft just northeast of the Dark Horse; a 6-in. sheet has been penetrated.

Platteville—A strike was made by the Cruson company 4 miles south of Platteville; 10 ft. of ore ground is being opened up with a sheet of jack as the center; this sheet was only 2 in. thick at the shaft, but has increased to 14 in. in 9 ft. of drift. The prospect drillings found on this property were probably the richest shown in this vicinity and the orebody so far explored is fully up to expectations.

Board of Trade—This company has foundations completed and material assembled for a new 100-ton mill which is expected to be in readiness in August.

Kennedy—A contract has been let to the Galena Iron Works for a new 100-ton mill, which will double the present milling capacity at this property. Gasolene power will be used in preference to steam, although hauling of coal is eliminated by immediate railroad facilities. The old plant, now in operation has steam power, but the company's experience with gasolene power at the St. Rose, Gruno and Sunrise mines, where gasolene was adopted mainly on account of a long haul, induces it to prefer gasolene to steam on an even footing.

Pittsburg Lead and Zinc Company—This company has purchased the 75-ton mill and equipment of the Cook Mining Company and is removing the plant to the Pittsburg lease.

Peni—This company, backed by Milwaukee capital, is building a 50-ton mill on the old Penitentiary range at Mifflin, on the lease formerly known as the Dove's Nest.

Washburn—This company has purchased the 50-ton mill of the New Crescent and will begin moving it at once.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending June 6 were as follows: Buffalo, 42,900 lb.; Crown Reserve, 44,000; City of Cobalt, 113,110; Kerr Lake, 101,650; La Rose, 120,000; Nipissing, 195,010; O'Orien, 183,840; Watts, 65,590; total, 866,500 pounds.

Cobalt-Central—The main shaft on the Big Pete is down 185 ft. and more than 1500 ft. of underground work has been done on the first and second levels. A station has been cut for the third level. The concentrator is treating 60 tons of ore daily. Experiments are being carried on with finer grinding of the tailings with a view of installing a Peebles' tubular mill. On the lot adjoining the Big Pete a shaft is down 25 ft. on a wide vein, 4 ft. of which is reported to be well mineralized.

Foster-Cobalt—President John G. Kent has issued a circular to shareholders embodying a report by Frank C. Loring on the present condition of the property. The report states that on vein No. 5 between levels 1 and 2 there are probably 600 tons of ore carrying more than 10 per cent. cobalt, but not more than 40 oz. silver to the ton. On vein No. 8 an underhand stope is being sunk from the first level from which the same rich ore as was extracted above this level is being taken. On vein No. 1, at the surface, an orebody extends southeast from the lake for 80 ft., probably extending into the lake. The depth and extent of this is unknown. On vein No. 1 at the second level, should the copper sulphide ore there exposed continue to any great extent, it could be profitably mined for copper as well as silver. Development work especially on veins Nos. 1, 5 and 8 gives additional proof that these veins are strong and will continue with depth. The report recommends vigorous and extensive additional exploration at depth; to meet this expense large cash reserves are recommended.

Little Nipissing—On the property leased by this company from the Peterson Lake company a new shaft house has been erected, connected with the ore house. The main shaft is down 60 ft. and the ore continues to improve with depth. The vein is 12 in. wide with 6 in. of rich ore carrying much native silver. The company has made its initial shipment of 20 tons, mainly high-grade ore.

Nancy Helen—Superintendent Black denies the reported closing down of the mine. He states that work is being car-

ried on day and night by an increased force. The new vein is 5 in. wide.

Rochester—On this property, which has not been worked for some months, operations were recently resumed with a small force.

La Rose Consolidated—The La Rose properties have been merged with a number of others and a new company formed capitalized at $6,5000,000; the par value is $5 per share. The properties embrace in all 317 acres and include the La Rose; the La Rose extension, comprising 40 acres immediately north; the University, 40 acres; the Violet, 100 acres; the Princess, 20 acres; the Fisher-Eplitt and the Silver Hill locations including the Brown lot south of the University. One million dollars of the capitalization has been set aside for the acquisition of other properties. The directorate comprises John McMartin, Duncan McMartin, Henry Timmins, Noah Timmins and David Dunlop, all of the La Rose, David Faskin, Toronto, E. P. Earle, Richard T. Greene and Frank Holmes, of New York.

Mexico

The section in the proposed new mining law restricting the ownership of mining property by foreigners has created a great deal of uneasiness among mining men throughout the republic. A commission from the chamber of mines consisting of the president of that body, Lic. J. L. Requena, Senator Ramon Alcaraz, Lic. Salvador Cancina, Lic. Carlos Robles and others called upon Minister of Finance Limantour protesting against the more radical proposals. They were assured that their wishes would receive due consideration.

Chihuahua

Production of Parral—The approximate production of the camp in April was 36,175 tons, of which 22,235 tons were treated locally and 13,940 shipped to the smelters.

Chihuahua

Chihuahua Smelting Works—The new plant of the American Smelting and Refining Company, completed several months ago, is now expected to begin operations early in July. Besides the ore received from the company's mines at Santa Eulalia, shipments are coming in from Naica to the amount of 3000 tons a month and 2000 tons a month from the Santa Barbara district. Other shipments of silicious ore from the Parral district have also begun.

Santo Domingo—The American Smelting and Refining Company is receiving bids for a proposed aërial tramway which is to transport ore from the Santo Domingo, Mina Vieja and Velardeña mines to the Mineral railroad. The length with the branches will be about five miles. The electric power plant at the Santo Domingo is in operation.

Guanajuato

Pastita—It is reported that the filters installed in this cyanide mill about six months ago will be replaced by others similar to those in use at the Guanajuato Reduction mill.

Jalisco

Amparo—James H. Howard, for several years superintendent of the company's mines in the Etzatlan district, has been appointed general manager of the company to succeed Ferdinand Sustersic, who has resigned.

Santa Eugenia—Machinery has been ordered for a 30-ton reduction plant for this and the Plomosa mine, near Amatlan de Cañas, Tepic. Stamps will be used for crushing and the treatment will be by concentration, amalgamation and cyanidation.

Nueva Leon

Bag House Installed—The new bag-house plant at Smeltery No. 3 has been inaugurated. The plant cost about $100,000. Other improvements at the plant are projected.

Monterey Steel Works—The 400-ton blast furnace which has been idle for several weeks, has been blown in. The steel plant has been running at full capacity for some time. About 1200 men are employed.

Sonora

Cananea Smelting Works—The arrangements for the free importation of crude oil to be used as fuel in the plant will be completed about June 30. The greater portion of the oil is expected to come from Bakersfield, Cal., and Beaumont, Tex. About 1000 men are now employed.

La Yaqui—This old mine, 40 miles southwest of Altar, is being developed below the old workings. The property has been idle for about 20 years.

Africa

Rhodesia

Gold production in April was 50,718 oz. fine, an increase of 1745 oz. over March. For the four months ended April 30 the total was 184,189 oz. in 1907, and 197,895 oz.—or $4,090,490—in 1908. The increase was really about 10 per cent. more than that shown by the figures. In 1907 the reports were made in ounces bullion, but this year the companies have adopted the more rational plan of making their returns in ounces of fine gold.

Transvaal

The production of gold in May is reported at 581,992 oz. fine. This is 16,160 oz. more than in April, and 57,575 oz. more than in May, 1907. It is the largest monthly production ever reported, with the exception of that for December, 1907. For the five months ended May 31 the total was 2,631,173 oz. in 1906, and 2,824,984 oz.—or $58,392,419—in 1908; an increase of 193,811 oz. this year.

Asia

India—Mysore

Kolar Goldfield—The gold production reported for May is 45,638 oz. bullion, which is 31 oz. more than in April, and 557 oz. more than in May, 1907. For the five months ended May 31 the total was 223,490 oz. bullion in 1907, and 227,114 oz. in 1908; an increase of 3624 oz. The bullion reported this year was equal to $4,225,010, or 204,403 oz. fine gold.

Australia

Western Australia

The gold production in May is reported as follows: Exported, 34,144 oz.; sent to mint and banks, 99,811; total, 133,955 oz. fine. This is 11,760 oz. less than in April, and 11,735 oz. less than in May, 1907. For the five months ended May 31 the total was 701,733 oz. in 1907, and 690,311 oz.—or $14,268,728— in 1908; a decrease of 11,422 oz. this year.

Dutch East Indies

The report of the Department of Mines for the fourth quarter of 1907 states that a number of borings for tin have been carried out at Banka, the majority of which have been crowned with satisfactory results.

The communications respecting prospecting operations at Benkoelen, Palembang, and Djambi are made with greater reserve than the former statements of gold seekers or private concession hunters.

The exploration at Tambangsawa has been continued and ore has been found carrying gold and silver in fair quantities. Further explorations are to be carried on.

Explorations are also being made on the old Karaeson concession at Rawas; on the Sei-Limoen river, and in the Djambi hills, where gold and cinnabar have been found.

West Indies

Barbados

The petroleum deposits have recently attracted attention, and an expert is to be sent from London to examine them. The first company, which started boring eight years ago, brought in a few producing wells. Its last producer was brought in at the end of 1906, and when tested yielded 18 bbl. per hour. Since then the company has shut down. Two other companies have begun boring since, but so far without result. The legislature passed an act four years ago giving the right of pre-emption on all oil produced in the island to the British Admiralty. This discouraged prospecting, instead of stimulating it, as was expected. Efforts are now being made to secure the passage of a new law, which will place oil leases on a workable basis, and induce operators to resume work. The geological conditions are favorable.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, June 17—Coal trade in the West is still quiet, though a slight improvement is reported at several points. The Lake trade opens slowly, and there is no haste, as there is still a supply at ports in the Northwest.

In the East trade in bituminous coal is also quiet, the demand for steam coal showing little increase. Coastwise trade is very slow for the season.

Anthracite producers are reported to be putting collieries on short time. The storage yards of the large companies are full, and at Lake ports there is a surplus of coal ready for shipment.

Coke traffic reported by leading roads is a little less than half of that for the corresponding period of last year.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to June 6, in short tons:

	1907.	1908.	Changes.
Anthracite.....	2,466,569	2,366,353	D. 100,216
Bituminous.....	16,431,039	13,781,518	D. 2,649,521
Coke.....	6,152,322	2,932,808	D. 3,219,514
Total.....	25,049,930	19,080,679	D. 5,969,251

Total decrease this year to date, 23.8 per cent. Decrease in coke, 52.3 per cent.

Coal passing through the Sault Ste. Marie canals for the season to June 1, short tons:

	1907.	1908.	Changes.
Anthracite.....	279,771	145,061	D. 134,710
Bituminous....	1,812,507	308,088	D. 1,504,419
Total.....	2,092,278	453,149	D. 1,639,129

The Lake Superior trade this year has hardly begun as yet.

Coal and coke shipments, Chesapeake & Ohio Railway, 10 months official year from July 1 to April 30, short tons:

	Coal.	Coke.	Total.
New River.....	4,739,611	170,439	4,910,050
Kanawha.....	3,842,857	74,638	3,917,495
Kentucky.....	228,590	.....	228,590
Connecting lines.....	146,545	50,436	196,981
Total.....	8,957,603	295,513	9,253,116
Total, 1907.....	8,111,076	371,974	8,483,050

Deliveries to points west of mines this year, 4,397,649 tons coal and 185,812 coke; points east, 1,357,567 tons coal and 109,701 coke; tidewater, 3,182,248 tons coal. Anthracite handled to line points, 20,319 tons.

New York

Anthracite

New York, June 17—There are no changes to report in the hard-coal market. Both prepared and small steam sizes are plentiful and in light demand. The Lake traffic has not yet opened, and there is a large accumulation at the lower Lake ports. Prices are as follows: Broken, $4.45; egg, stove and chestnut, $4.70; pea $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.65@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

The demand for soft coal is variable. In the far East and around Boston consumers are absorbing an increased tonnage. Along the Sound and in New York harbor very little coal is being taken. In New England there seems to be a tendency among the mills to take more coal than for some time; especially with those consumers who are obliged to carry a large stock for the winter. Good grades of steam coal are selling as low as $2.40, New York harbor.

It is surprising that more consumers are not taking advantage of present low prices. Coal is selling for 40 or 50c. less than at this time last year; while freight rates are about 50c. per ton lower, making in all a saving of 90c. or $1. Even this large saving has not stimulated trade to any great extent.

Transportation from mines to tide is good, and car supply is up to all demands. In the coastwise trade both large and small boats are tied up in large numbers. Small vessels are rather scarce. Freight rates are as follows from Philadelphia: To Boston, Salem and Portland, 50@55c.; Lynn, 55@60c.; Newburyport, 75c.; Portsmouth, 55@60c.; Saco, 90c.; Bath, 60@65c.; Gardiner, 65c.; Bangor, 70@75c.; to the Sound, 45@50c. Towages where usual.

Chicago

June 15—Sales of coal are in general improving. Fine coals continue to be sought, making sales of lump difficult. Eastern coals are in general weak and care should be exercised about sending them to the Chicago market. Contract making continues to hold off.

Illinois and Indiana coals bring $1.75@2.15 for lump, $1.65@1.75 for run-of-mine and $1.40@1.60 for screenings. Hocking is fairly firm and in good demand at $3@3.15. Smokeless has been in rather large supply, and has been cut as much as 25c. under circular. Youghiogheny holds to circular for gas and steam coal.

Anthracite sales are becoming good in the country, though lagging in the city.

Birmingham

June 15—The resumption of operations at furnaces and steel plants causes resumption of operations in the coalfields. The union coal miners of Alabama, who number now between 3500 and 4000, will have trouble in agreeing on a wage scale with the commercial coal operators. There are some intimations that the commercial operators will not recognize the miners, but it is believed that the conditions may come out satisfactorily to both sides, if the miners make concessions to meet conditions at non-union mines.

The coke production is better with a larger demand.

Pittsburg

June 16—All minor disputes on the two-year wage agreement have been satisfactorily adjusted and no further trouble is expected. The railroad mines are running about 75 per cent. of capacity, and the river mines practically full. Prices unchanged, despite reports of cutting. Mine-run coal on contract is $1.15 at mine and slack 75c. Most of the coal mined is going to Lake ports for the northwestern trade. There are not enough boats to carry away the coal at the docks, but an ample supply of railroad cars.

Connellsville Coke—While there has been some improvement in the coke business this week, it is not pronounced. All the large operators have many inquiries for last half and some are for deliveries running for one year from July 1. There has been a decline in furnace coke and for both spot and on contract the range is $1.65@1.75. Foundry coke is $2.10@2.25, and some large contracts are likely to be closed shortly. The *Courier* gives the production in both fields at 155,846 tons. The shipments were 6102 cars as follows: To Pittsburg, 2172; to points west of Connellsville, 3470; to points east of Connellsville, 460 cars.

Foreign Coal Trade

United States Coal Exports—The coal bunkered, or supplied to steamships in foreign trade at United States ports, four months ended April 30, was 1,942,595 long tons in 1907, and 1,985,641 in 1908; increase, 43,046 tons. Adding the exports, previously reported, makes total coal sold for consumption outside of the United States for the four months 5,172,527 tons in 1907, and 5,040,407 in 1908; decrease, 132,120 tons.

German Coal Trade—Imports and exports of fuel in Germany, four months ended April 30, metric tons:

Imports:	1907.	1908.	Changes.
Coal	3,366,525	3,360,489	D. 6,036
Brown coal	2,833,082	2,977,992	I. 144,910
Total coal	6,199,607	6,338,481	I. 138,874
Coke	142,608	169,081	I. 26,473
Briquets	54,614	62,693	I. 8,079
Exports:			
Coal	6,582,930	6,357,243	D. 225,687
Brown coal	5,330	7,903	I. 2,573
Total coal	6,588,260	6,365,146	D. 223,114
Coke	1,181,140	1,196,035	I. 14,895
Briquets	371,182	548,701	I. 177,519

Exports of coke this year included 4202 tons to the United States. Imports of peat fuel this year, 4220 tons; exports, 6119 tons.

German Coal Production—Coal production of Germany, four months ended April 30, metric tons:

	1907.	1908.	Changes.
Coal	46,870,753	49,293,530	I. 2,422,777
Brown coal	19,842,617	21,661,840	I. 1,819,223
Total mined	66,713,370	70,955,370	I. 4,242,000
Coke made	7,015,189	7,178,306	I. 163,117
Briquets made	5,089,411	5,854,721	I. 765,310

Of the briquets made this year 4,526,688 tons were from brown coal, or lignite.

British Coal Production—Coal production from quarries, or open workings in Great Britain in 1907 was 18,110 tons. This makes the total production for the year 267,830,962 long tons, against 251,067,628 in 1906; showing an increase of 16,763,334 tons, or 6.7 per cent.

Welsh Coal Trade—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices at Welsh ports as follows, under date of June 6: Best Welsh steam, $3.96; seconds, $3.72; thirds, $3.60; dry coals, $3.84; best Monmouthshire, $3.48; seconds, $3.36; best small steam, $2.28; seconds, $2.10. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, June 17—The immediate effect of the reduction in prices made last week has not been great, and the market must still be reported dull. Aside from the tonnage of bars taken by the agricultural implement makers, finished material has not moved with any degree of freedom. Many buyers believe that further reductions are in order, and they are sustained by reports of cutting on structural steel by certain makers, which are freely circulated. It looks as if further reductions were needed to start business.

While the cut in steel bars was nominally only to 1.40c. Pittsburg, it is understood that some large contracts were made with the agricultural implement makers as low as 1.25c. Pittsburg; while iron bars were placed at 1.20c. on large contracts.

Pig iron, which has probably touched nearly the lowest point, has been fairly active, though less so than in some previous weeks. There is, however, an increasing tendency to make forward contracts.

The new Lake iron ore prices will be: Old Range bessemer, $4.50; Mesabi bessemer, $4.25; Old Range non-bessemer, $3.70; Mesabi non-bessemer, $3.50 per ton; all f.o.b. Lake Erie port. The guarantee remains at 55 per cent. iron for bessemer and 51.5 per cent. for non-bessemer ores; moisture assumed at 10 and 12 per cent., respectively.

Lake Superior Iron Ore—Shipments of Lake Superior ore by ports for the season to June 1 are reported as follows:

	1907.	1908.	Changes.
Escanaba	1,014,339	16,245	D. 998,094
Marquette	376,873	.....	D. 376,873
Ashland	495,194	21,128	D. 474,066
Superior	1,101,183	132,818	D. 968,365
Duluth	1,937,830	86,691	D. 1,851,139
Two Harbors	1,326,842	28,433	D. 1,298,409
Total	6,252,261	285,315	D. 5,966,946

Shipments will not be large until the great stocks at docks and furnaces are worked off.

Baltimore

June 15—Exports for the past week included 806 tons steel billets, to Liverpool; 738,481 lb. tin scrap, to Rotterdam; 44,745 lb. copper sulphate, also to Rotterdam.

Birmingham

June 15—Southern producers are now asking $12.50 per ton, No. 2 foundry, for pig iron and a little business is still being done. Consumers are buying in small lots. It is estimated that during the recent activity in selling the Southern producers booked orders for something like 600,000 tons; but a great amount of this is said to have been taken by brokers or speculators, who will hardly order delivery until they see some profit in the business. A stipulation was made with some of the iron sold that it was not to be unloaded on the market until a certain time. The make is being improved, three blast furnaces having been started up in the last 10 days. The charcoal furnace at Shelby and the little Williamson furnace, in Birmingham, are soon to be in operation. Cast-iron pipe plants and a few of the foundries and machine shops appear to be really busy. The Bessemer rolling mills will be on during this week.

Chicago

June 15—Sales of iron have been of small to medium-sized amounts in the last week but have been numerous, making an aggregate volume satisfactory to furnace interests. The cuts in prices of steel products have stimulated buying of such products slightly. The average consumer is probably becoming more and more convinced that his interests warrant buying soon; otherwise there is no noteworthy change in market conditions.

Northern iron holds at about $17.50 for No. 2, on second-half deliveries, with a range of 50c. above and below. Southern hovers about the $12 Birmingham base making the cost at Chicago to the melter $16.35 standard. Efforts to hold up Southern to $12.50 Birmingham seem likely to prevail on general contract supplies.

Sales of coke are increasing, the best Connellsville remaining at $4.90, with plenty of coke on track.

Philadelphia

June 17—During the last week Eastern furnaces have picked up a good deal of business in pig that was unexpected. The delivery is mostly for July-October. The tone of the market is stronger because of these sales. Schuylkill Valley furnacemen are holding to their rates, while in other Pennsylvania territory sales for cash have been made at a sacrifice. The pig-iron market is not regarded as settled as to prices.

Steel Billets—Present quotations would be satisfactory to contemplating buyers, if they could be relied upon to be permanent.

Bars—Eastern bar-iron makers have not been able to make the same concessions as have been made in Western markets. Mills report a slight improvement in small orders. Large orders are scarce.

Sheets—The improvement in all kinds of sheet iron continues, but the mills are by no means fully employed.

Merchant Steel—The retail demand for merchant steel has perceptibly improved, but orders are limited to near-by needs.

Pipes and Tubes—There is nothing very definite, but the pipe and tube branch is approaching better conditions.

Plates—The recent reductions have not made business better in this territory. The few buyers who are in the market are in a position to wait.

Scrap—The activity in pig has helped certain kinds of scrap. Yard men cleaned out all they had in heavy steel and heavy cast scrap. Machinery scrap has had a good week. Other kinds are dull.

Pittsburg

June 16—The reduction in prices ordered by the associated steel manufacturers has not had the effect of bringing out new business and the markets are as dull this week as at any time since last October. It seems to be the general opinion among consumers that the cuts were not as great as they should have been. A meeting of wire interests began here today and it is believed that the question of reduction in wire products is the main object. The wire trade has been remarkably good for a dull period, but during the past few weeks there was a decided falling off. The mills are being operated to less than half capacity. A well attended meeting of independent sheet and tinplate manufacturers was held on Friday. Reports on conditions were received and prices taken up.

It seemed to be the general opinion that a cut in sheets would result in increased business, but that present prices of tinplate could easily be maintained, as demand is excellent. After an all-day session it was determined to maintain prices. The general average operations of all of the steel mills in the Pittsburg district are less than 50 per cent. Iron bars are becoming firmer. The cut in steel bars did not bring out as much new business as was expected.

The Amalgamated Association has received the consent of the American Sheet and Tin Plate Company and the Republic Iron and Steel Company to meet in conference and discuss the new scales.

Pig Iron—This week was the dullest of the year. There were no transactions either large or small reported, outside of several lots of Southern iron. The minimum quotations for both spot and third-quarter delivery are as follows: Bessemer, $16; malleable bessemer, $15.50; basic, $15.25; No. 2 foundry, $15; gray forge, $14, all at Valley furnaces.

Steel—There was some improvement in tinplate bars through the cut from $29.50 to $27.50, delivered. Plates appear to be firm at 1.60c. and steel bars at 1.40c. Pittsburg.

Sheets—The trade is dull, but prices unchanged. Black sheets are 2.50c. and galvanized 3.55c. for No. 28 gage.

Ferro-Manganese—Prices are a trifle higher. Quotations range from $47 to $47.50, Pittsburg.

Foreign Iron Trade

Iron Ore in Great Britain—The total production of iron ore in Great Britain in 1907 was: From mines, 10,039,064; from quarries or open pits, 5,692,540; total 15,731,604 long tons. The total in 1906 was 15,400,406 tons, the increase last year being 331,199 or 2.2 per cent. Imports in 1907 were 7,638,934 tons, making a total supply of 23,370,538 tons, equal to 2.355 tons per ton of pig iron made.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, June 17.

At all U. S. Ports in May and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
May 1908..	$26,555,913	$ 3,069,402	Exp. $23,486,511
" 1907..	4,505,444	2,682,163	" 1,823,281
Year 1908..	44,891,257	22,926,623	" 21,964,634
" 1907..	12,428,592	19,303,305	Imp. 6,874,713
Silver:			
May 1908..	4,028,334	3,362,176	Exp. 666,158
" 1907..	4,326,216	3,563,096	" 763,120
Year 1908..	21,077,185	17,660,758	" 3,416,427
" 1907..	23,858,610	18,919,065	" 4,939,545

Exports from the port of New York, week ended June 13: Gold, $1,702,800, to Germany and the West Indies; silver, $754,080, to London. Imports: Gold, $11,390; silver, $47,114, both from South America and Mexico.

Specie holdings of the leading banks of the world June 13, are reported, as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	$301,467,500
England	$189,968,175	.....	189,968,175
France	622,098,480	$182,941,095	805,039,575
Germany	181,465,000	75,205,000	256,670,000
Spain	77,970,000	133,225,000	211,195,000
Netherlands	38,507,000	20,899,000	59,406,000
Belgium	21,233,335	10,616,665	31,850,000
Italy	182,445,000	22,050,000	204,495,000
Russia	559,860,000	38,090,000	597,950,000
Aust.-Hungary	233,775,000	66,565,000	300,340,000
Sweden	19,455,000	.....	19,455,000
Norway	7,610,000	.....	7,610,000
Switzerland	17,775,000	.....	17,775,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

The foreign commerce of the United States, five months ended May 31, valued by Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1907.	1908.
Exports	$ 802,710,742	$ 762,215,078
Imports	688,768,968	430,533,042
Excess, exports	$ 163,941,744	$ 331,682,036
Add excess of exports, silver		3,416,427
Add excess of exports, gold		23,486,511
Total export balance		$ 358,584,974

The gold and silver movement in detail will be found in the table at the head of this column.

Silver Market

SILVER AND STERLING EXCHANGE.

June.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	June.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
11	4.8635	53⅞	24⅜	15	4.8700	54	24⅞
12	4.8680	53¾	24⅜	16	4.8710	53⅞	24⅞
13	4.8675	53⅞	24⅜	17	4.8710	53⅞	24⅞

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Mssrs. Pixley & Abell report silver shipments from London to the East for the year to June 6:

	1907.	1908.	Changes.
India	£5,445,244	£3,584,018	D. £1,861,226
China	..	516,400	I. 516,400
Straits	491,862	90,200	D. 401,662
Total	£5,937,106	£4,190,618	D. £1,746,488

Imports for the week were £170,000 from New York, £12,000 from Mexico, £6000 from the West Indies and £1500 from Chile; total, £189,500. Exports were £2000 to Egypt and £411,600 to India; £413,600 in all.

Owing to favorable rains and better crop prospects in India, silver shows some tendency to improve in price. A slight advance is considered probable, but as the Indian treasury is full of rupees, the Government is not likely to be a buyer of silver soon; so that the advance will depend on bazaar orders.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

June.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
11	12¾ @13	12⅝ @12¾	58⅝	28¼	4.47½ @4.52½	4.55 @4.57½	4.40 @4.42½
12	12⅝ @13	12⅝ @12⅞	58¼	28¼	4.47½ @4.52½	4.52½ @4.55	4.37½ @4.40
13	12⅝ @13	12⅝ @12⅞	.....	28¼	4.47½ @4.52½	4.52½ @4.55	4.37½ @4.40
15	12⅝ @13	12⅝ @12⅞	58¼	28¼	4.47½ @4.52½	4.52½ @4.55	4.37½ @4.40
16	12⅝ @13	12⅝ @12⅞	58	28¼	4.47½ @4 52½	4.52½ @4.55	4.37½ @4.40
17	12⅝ @13	12⅝ @12⅞	58¼	28	4.47½ @4.52½	4.52½ @4 55	4.37½ @4.40

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electroytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Frequent inquiries from the rank and file of consumers have been the mainstay of the market. The quantities involved are not heavy, but the business done shows an increasing consumption in different directions. While early in the week some fair-sized lots were sold for export, the sales to Europe fell off considerably during the latter part of the week. The market closes steady at 12⅞ @13c. for Lake copper; 12⅝@12⅞c. for electrolytic in ingots, cakes and wirebars. The average for the week for casting copper was 12⅜@12½ cents.

The standard market in London has fluctuated within narrow limits, and the closing is cabled at £58 5s. for spot, £58 15s. for three months.

Statistics for the first half of the current month show an increase in the visible supplies of 2200 tons.

Refined and manufactured sorts we quote: English tough, £60 10s.@£61 10s.; best selected, £60 10s@£61 10s.; strong sheets, £72 10s.@£73 10s.

Manufactured Copper—Sheets, cold-rolled, 18c.; hot-rolled, 17c. Wire, 14¾c. base.

Tin—The market throughout the week has shown no special features and was a rather dull affair. The close is cabled from London as weak at £127 7s. 6d. for spot, £128 for three months, while such retail business as is being done in this market was consummated at about 28 cents.

The tin output of the Federated Malay States for the four months ended April 30 was 256,257 pikuls in 1907, and 282,305 pikuls—16,804 long tons—in 1908; an increase of 26,048 pikuls.

Lead—A good business has been doing in this metal at unchanged prices, the close being 4.47½@4.52½c. New York.

The London market has stiffened somewhat and closes higher at £12 13s. 9d. for Spanish lead, £12 15s. for English lead.

Canadian Lead Bounty—The Minister of Finance has introduced a resolution in the Dominion Parliament to renew the bounty on lead in ores mined in Canada for five years from June 30, 1908. At present the bounty is 75c. per 100 lb., but it is reduced when the London price exceeds £12 10s. per ton, to correspond with the advance, and ceases entirely when the London price is £16, or over. By the new resolution. the bounty will be 75c. per 100 lb., but no reduction will be made until the London price exceeds £14 10s. per ton. The total amount to be paid as bounty is not to exceed $2,500,000 in five years.

Spelter—The market is again in a state of inertia and sales could only be effected at a sacrifice. The close is more or less nominal at 4.37½@4.40c. St. Louis, 4.52½@4.55c. New York.

The London market, after having a little spurt during the week, closes unchanged at £19 2s. 6d. for good ordinaries, £19 7s. 6d. for specials.

Zinc Sheets—Base price is 7c., f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The market is lifeless, both in New York and abroad. Prices are 8⅜@8¾c. for Cookson's, 8½@8⅝c. for Hallett's and 8@8⅛ for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base. Foreign metal is offered at rather lower prices.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 45@50c., New York.

Quicksilver—New York is a little lower, sales being made at $44 per flask for large lots; $45 for jobbing orders. San Francisco, large lots nominal at $44.50, domestic, and $43, export; small orders, $45@46. London, £8 5s.

Platinum—The market is quiet and unchanged. Prices are $23.50 per oz. for hard platinum, $21 for ordinary and $16 for scrap.

Wisconsin Ore Market

Platteville, Wis., June 13—The highest price paid this week for zinc ore was $35, on a basis of $32@34 per ton of 60 per cent. zinc. The best grade of lead ore sold at $59 per ton. Shipments were made as follows:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Hazel Green	669,700	59,700	.....
Platteville	634,760	.....	.....
Benton	334,220	.....	.....
Cuba City	196,630	88,000	.....
Days Siding	155,300	.....	.....
Livingston	140,000	.....	.....
Highland	133,300	.....	.....
Dodgeville	130,000	.....	.....
Mineral Point	116,200	59,100	.....
Elmo	87,300	.....	.....
Harker	65,890	.....	.....
Linden	.....	.....	56,710
Total	2,663,300	206,800	56,710
Year to June 13	38,861,525	3,968,205	182,530

In addition to the above there was shipped to the electrostatic separator at Platteville, from Benton, 297,350 lb.; from Strawbridge, 237,900 lb.; from Rewey, 66,000 lb.; and from Linden, 137,100 lb. of zinc concentrates. There was also shipped to the Joplin Separator Works at Galena, from Rewey, 123,000 lb., and from Highland, 65,920 lb. of zinc concentrates. Galena shipped 150,000 lb. of lead ore, not reported, last week.

Missouri Ore Market

Joplin, Mo., June 13—The highest price paid for zinc was $36.50, the base $31@34, generally, with one bin of 100 tons selling late in the week on a $35 base. The average price was $31.94 per ton. The highest price paid for lead was $61, medium grades selling at $60 to $61, and all grades averaging $60.02 per ton. At least one week-end sale of lead was made at $62.50 per ton. The Picher Lead Company is increasing its capacity 100 per cent., and is securing a reserve stock.

It is probable the export idea on zinc has been abandoned, as the heavy wind and rain, and the low price have so reduced the output that an advance of $1 per ton was made the latter part of this week, with the probability of another $1 advance before the end of another week. The mines voluntarily closing down effected a reduction of 500 tons per week, while the heavy storms of the week will reduce the output next week at least an additional 500 tons.

Following are the shipments from the district for the week ending June 13:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	5,174,900	449,430	$96,280
Joplin	2,262,890	250,640	45,422
Alba-Neck	921,930	.....	15,672
Duenweg	660,530	92,800	12,287
Galena	515,590	118,810	11,813
Aurora	435,790	13,370	8,150
Oronogo	444,540	4,620	7,688
Prosperity	149,910	153,430	7,000
Badger	201,670	101,880	6,383
Granby	321,800	32,000	5,475
Spurgeon	165,440	35,410	2,942
Carthage	163,300	.....	2,776
Sarcoxie	122,120	.....	1,953
Miami	131,150	.....	1,311
Zincite	81,910	.....	1,269
Carl Junction	72,520	.....	1,160
Cave Springs	63,150	.....	1,010
Wentworth	85,890	.....	843
Peoria	26,960	.....	269
Totals	12,001,990	1,252,390	$229,703
24 weeks	221,048,050	33,027,840	$4,645,344
Zinc value, the week, $191,163; 24 weeks, $3,782,004			
Lead value, the week, 38,540; 24 weeks, 863,340			

Average ore prices in the Joplin market were, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1907.	1908.	Month.	1907.	1908.
January	45.84	35.56	January	83.58	46.88
February	47.11	34.92	February	84.58	49.72
March	48.66	34.19	March	82.75	49.90
April	48.24	34.08	April	79.76	52.47
May	45.98	33.39	May	79.56	56.05
June	44.82	.....	June	73.66	.....
July	45.79	.....	July	58.18	.....
August	43.22	.....	August	59.54	.....
September	40.11	.....	September	53.52	.....
October	39.83	.....	October	51.40	.....
November	35.19	.....	November	43.40	.....
December	30.87	.....	December	37.71	.....
Year	43.68	.....	Year	68.90	.....

Chemicals

New York, June 17—The market is unchanged and buying continues from hand-to-mouth. The textile, soap, paper and glass industries are quiet and are consuming only small quantities of chemicals, purchased for immediate needs. Dealers in clays and earths report slightly better business.

Copper Sulphate—The tone of the market is firmer. Prices are unchanged at $4.65 per 100 lb. for carloads and $4.90 for smaller lots.

Nitrate of Soda—Buyers are out of the market and the situation is quiet. Dealers are not, as a rule, making any price concessions. Quotations are unchanged at 2.32½c. for spot and 2.30c. for other positions of 1908.

Sulphur—Messrs Emil Fog & Co., report the exports of sulphur from Sicily, with stocks on hand as follows, in tons of 1030 kg.:

	1907.	1908.	Changes.
March	52,392	54,366	I. 1,974
Three months	106,937	125,408	I. 18,471
Stocks, March 31	505,295	548,094	I. 42,799

March exports included 1948 tons to the United States this year.

Mining Stocks

New York, June 17—The general stock markets have been rather dull during the week, with light trading and with only small fluctuations, but no marked recessions in prices. The market is apparently waiting for the result of the Republican convention at Chicago.

On the curb there was also light trading, but prices were generally firm. The copper stocks showed more activity than some others, but sales were not heavy. Fluctuations were light, and in both directions.

Boston

June 16—It is a case of inertia, so far as the mining-share market is concerned, although prices are a trifle better than a week ago, with but few exceptions. The so-called Coram stocks were under severe selling pressure one day last week, particularly Davis-Daly, on the curb. This specialty sold as low as $1.43¾ on realization that a reorganization is necessary

whereby $1,500,000 of new money can be procured. Mexico Consolidated was sold down on the Exchange from $5.75 to $4.62½, with recovery to $5.50. Montana Coal and Coke also broke from 75 to 40c. the same day.

Amalgamated is up $1.62½ to $68.12½ for the week. Mohawk mining directors declared a $2.50 dividend. The previous dividend was $5 in July, 1907. The stock has advanced $4.50 to $63.50. Old Dominion is up $2 to $36, and Osceola $2 to $92.

North Butte has been well bought and is up $3 to $68.75, ex-dividend. Calumet & Hecla is off $15 to $660 on very light trading, and Calumet & Arizona is up slightly to $109.25.

Miami rose sharply on the curb to $7.50. United States Coal and Oil 6-per cent. bonds have been put on the unlisted department of the Stock Exchange.

Salt Lake City

June 13—Lively trading has been witnessed on the Salt Lake Stock and Mining Exchange during the past two weeks and records have been broken in the volume of business. Last week the sales aggregated 1,500,000 shares, representing a selling value of almost $1,000,000. Tintic stocks have been the most attractive, and in a number of instances, fluctuations have been very wide, particularly in Sioux Consolidated and Iron Blossom, new properties which have been undergoing development. The Salt Lake Exchange has become one of the most active organizations of the kind in the country.

STOCK QUOTATIONS

NEW YORK June 16	
Name of Comp.	Clg.
Alaska Mine	7/8
Amalgamated	27⅞
Anaconda	43⅜
Balaklala	‡1
British Col. Cop.	4⅞
Butte & London	
Butte Coalition	23⅛
Colonial Silver	‡½
Cum. Ely Mining	7¾
Davis Daly	1½
Dominion Cop	1¾
Douglas Copper	‡33¾
El Rayo	2⅜
Florence	3
Foster Cobalt	60
Furnace Creek	.15
Giroux	3¼
Gold Hill	⅛
Goldfield Con	5⅝
Granby	100
Greene Gold	⅛
Greene G. & S	¼
Greenw'r & D.Val.	.75
Guanajuato	‡2¼
Guggen. Exp.	‡150
Hanapah	‡.20
McKinley Dar.	75
Micmac	3⅛
Mines Co. of Am.	1½
Mitchell Mining	‡½
Mont. Sho.C	⅞
Nev. Utah M. & S.	3⅛
Newhouse M. & S.	6¼
Nipissing Mines	7
Old Hundred	½
Silver Queen	1/16
Stewart	⅛
Tennessee Cop'r	36⅛
Tri-Bullion	1¾
Union Copper	¾
Utah Apex	4⅛
Utah Copper	63¾
Yukon Gold	4

BOSTON June 16	
Name of Comp.	Clg.
Adventure	‡2
Allouez	‡27
Am. Zinc	27½
Arcadian	3¾
Arizona Com	18¼
Atlantic	16¼
Bingham	.68
Boston Con	11⅞
Calumet & Ariz	109¼
Calumet & Hecla	660
Centennial	23
Con. Mercur	.42
Copper Range	72½
Daly West	10¾
Franklin	9⅜
Greene—Can	11⅛
Isle Royal	18½
La Salle	14½
Mass	4¼
Michigan	9
Mohawk	62¾
Nevada	12
North Butte	68¾
Old Colony	‡.50
Old Dominion	36
Osceola	92
Parrot	23⅝
Quincy	84
Rhode Island	3½
Santa Fe	1⅞
Shannon	13¾
Superior	16¾
Tamarack	60
Trinity	12¾
United Cop., com.	‡6¾
U. S. Oil	25¾
U. S. Smg. & Ref.	38
U.S.Sm. & Re.,pd.	41¾
Utah Con	42¾
Victoria	5
Winona	6
Wolverine	130
Wyandotte	1

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	23¾
Am. Smelt. & Ref.	76¾
Am. Sm. & Ref., pf.	99⅛
Bethlehem Steel	‡15
Colo. Fuel & Iron	27½
Federal M. & S.,pf.	74½
Inter. Salt	‡18½
National Lead	66⅛
National Lead, pf.	‡99¾
Pittsburg Coal	12
Republic I. & S.	18
Republic I.& S.,pf.	66¾
Sloss-Sheffield	50
Standard Oil	607
U. S. Red. & Ref.	10
U. S. Steel	37⅞
U. S. Steel, pf	102
Va. Car. Chem	24

BOSTON CURB	
Ahmeek	‡70
Black Mt.	4
East Butte	6¼
Hancock Con	4
Keweenaw	‡6½
Majestic	.60
Raven	‡1 1/16
Shawmut	.34
Superior & Pitts.	12⅞
Troy Man	.40

ST. LOUIS June 13		
N. of Com.	High.	Low.
Adams	.30	.20
Am. Nettie	.03	.02
Center Cr'k	2.00	1.50
Cent. C. & C.	69.00	67.00
C.C. & C. pd.	78.00	76.00
Cent. Oil	110.00	100.00
Columbia	4.00	3.00
Con. Coal	14.00	12.00
Doe Run	120.00	110.00
Gra. Bimet.	.20	.15
St. Joe.	15.00	12.00

LONDON June 17			
Name of Com.	Clg.		
Dolores	£1	5s	0d
Stratton'sInd.	0	1	3
Camp Bird	0	13	0
Esperanza	1	10	0
Tomboy	1	13	9
El Oro	1	5	0
Oroville	0	10	9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. June 17.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.14
Belcher	.19	St. Ives	.26
Best & Belcher	.45	Triangle	.03
Caledonia	...	BULLFROG STOCKS	
Challar	.05	Bullfrog Mining	.03
Comstock	...	Bullfrog Nat. B	.05
Con. Cal. & Va	.52	Gibraltar	.04
Crown Point	.30	Gold Bar	.04
Exchequer	.16	Homestake King	.29
Gould & Curry	.12	Montgomery Mt.	.06
Hale & Norcross	.24	Mont. Shoshone C.	.70
Mexican	.39	Original Bullfrog	.01½
Ophir	2.50	Tramp Cons	.14½
Overman	.80	MANHAT'N STOCKS	
Potosi	.10	Manhattan Cons.	.09
Savage	.27	Manhat'n Dexter	.04
Sierra Nevada	.15	Jumping Jack	.04
Union	.22	Stray Dog	.03
Utah	...	MISCELLANEOUS	
Yellow Jacket	.48	Golden Boulder	.07
TONOPAH STOCKS		Bonnie Clare	.07
Belmont	.80	Lee Gold Grotto	...
Extension	.80	Nevada Hills	1.75
Golden Anchor	.02	Nevada Smelting	1.00
Jim Butler	.23	Pittsburgh S. Pk.	1.16
MacNamara	.35	Round Mt. Sphinx	.26
Midway	.34		
Montana	1.45		
North Star	.06		
Tono'h Mine of N.	8.00		
West End Con	.43		
GOLDFI'D STOCKS			
Adams	.04		
Atlanta	.18		
Booth	.15		
Columbia Mt	.13		
Comb. Frac	.49		
Cracker Jack	.04		
Dia'dfield B. B. C.	.16		
Goldfield Belmont	.14		
Goldfield Daisy	...		
Great Bend	.23		
Jumbo Extension	.25		
Katherine	...		
Kendall	.14		
Lone Star	.06		
May Queen	.05		
Oro	.08		
Red Hill	.18		
Roanoke	...		
Sandstorm	.22		

COLO. SPRINGS June 13	
Name of Comp.	Clg.
Acacia	5¼
Black Bell	...
C. C. Con	‡3¼
Dante	‡7½
Doctor Jack Pot	3½
Elkton	58½
El Paso	36
Findlay	22
Gold Dollar	‡5¾
Gold Sovereign	2¾
Isabella	35
Index	...
Jennie Sample	‡3
Jerry Johnson	...
Mary McKinney	23
Pharmacist	‡3¼
Portland	1.00
Un. Gold Mines	‡4½
Vindicator	87
Work	‡9½

Assessments

Company.	Delinq.	Sale.	Amt.
Andes, Nev.	Apr. 23	May 15	$0.10
Belcher, Nev.	Apr. 29	May 20	0.10
Big Creek, Ida.	Apr. 17	May 16	0.01
Brunswick Con., Cal.	May 27	June 26	0.03
Butler-Liberal, Utah.	Apr. 25	May 13	0.02
Century, Utah	Apr. 14	May 14	0.02
Charm, Utah.	Apr. 31	May 13	0.01
Federal	Apr. 25	May 18	0.05
Jenny Lind, Cal.	May 11	May 28	0.05
New Red Wing, Utah.	May 2	May 19	0.01
New Stockton, Utah.	May 11	June 1	0.01
Old Evergreen	Apr. 14	May 14	0.02
Oro Cobre, Cal.	Apr. 17	May 16	0.02
Posey Canyon, Cal.	Apr. 28	May 16	0.10
Potosi, Nev.	Apr. 20	May 3	0.02½
Wabash, Utah.	May 9	June 1	0.10
Washakie-Nev., Nev.	Apr. 20	May 7	0.15
Western Mines, Nev.	Mar. 16	Apr. 23	0.01½
Zelbright, Cal.	May 12	June 1	0.05

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.981	52.795	30.471	24.377
June	67.090	.....	30.893	.....
July	68.144	.....	31.366	.....
August	68.745	.....	31.637	.....
September	67.792	.....	31.313	.....
October	62.435	.....	28.863	.....
November	58.677	.....	27.154	.....
December	54.565	.....	25.362	.....
Year	65.327	.....	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62.386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	22.665	.....	24.140	.....	97.272	.....
July	21.130	.....	21.923	.....	95.016	.....
August	18.356	.....	19.255	.....	79.679	.....
September	15.565	.....	16.047	.....	68.375	.....
October	13.169	.....	13.551	.....	60.717	.....
November	13.391	.....	13.870	.....	61.226	.....
December	13.163	.....	13.393	.....	60.113	.....
Year	20.004	.....	20.661	.....	87.007	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	.....
February	42.102	28.978	August	37.667	.....
March	41.313	30.577	September	36.689	.....
April	40.938	31.702	October	32.620	.....
May	43.149	30.015	November	30.833	.....
June	42.120	.....	December	27.925	.....
			Av. year	38.166	.....

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6,000	3.691	19.828	14.469
February	6,000	3.725	19.531	14.250
March	6,000	3.838	19.703	13.975
April	6,000	3.993	19.975	13.469
May	6,000	4.253	19.688	12.938
June	5,760	.....	20.188	.....
July	5,288	.....	20.350	.....
August	5,250	.....	19.063	.....
September	4,813	.....	19.775	.....
October	4,750	.....	18.531	.....
November	4,376	.....	17.281	.....
December	3,658	.....	14.500	.....
Year	5.325	.....	19.034	.....

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26.094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	.....	6.269	.....	25.469	.....
July	6.072	.....	5.922	.....	23.850	.....
August	5.701	.....	5.551	.....	21.969	.....
September	5.236	.....	5.086	.....	21.050	.....
October	5.430	.....	5.280	.....	21.781	.....
November	4.925	.....	4.775	.....	21.438	.....
December	4.254	.....	4.104	.....	20.075	.....
Year	5.962	.....	5.812	.....	23.771	.....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

Metal and Mining Companies—U. S.

Name of Company and Location.		Autho. ized Capital	Shares. Issued.	Par Val.	Dividends. Total to Date.	Latest. Date.	Amt.
Alaska Mexican, g.	Al'ka	$1,000,000	180,000	$ 5	$1,896,381	Apr. 1908	$ .50
Alaska Treadwell,g.	Al'ka	5,000,000	200,000	25	9,935,000	Apr. 1908	.75
Alaska United, g.	Al'ka	1,000,000	180,200	5	333,370	Jan. 1908	.15
Amalgamated, c.	Mont	155,000,000	1,530,879	100	56,718,304	May 1908	.50
Am.Sm.&Ref.,com.	U. S.	50,000,000	500,000	100	13,625,000	July 1908	1.00
Am. Sm. & Ref. pf.	U. S.	50,000,000	500,000	100	27,961,053	July 1908	1.75
Am. Smelters, pf. A	U. S.	17,000,000	170,000	100	2,705,000	June 1908	1.50
Am. Smelters. pf. B	U. S.	30,000,000	300,000	100	4,500,000	June 1908	1.25
Am.Zinc,Lead&Sm.	Kan.	3,750,000	80,000	25	280,000	Nov. 1907	.50
Anaconda,c.	Mont	30,000,000	1,200,000	25	39,650,000	Apr. 1908	.50
Arizona, c.	Ariz	3,775,000	3,682,520	....	6,182,361	Apr. 1906	.05
Atlantic, c.	Mich	2,500,000	100,000	25	990,000	Feb. 1905	.02
Bald Butte, g. s.	Mont	250,000	250,000	1	1,354,648	Oct. 1907	.04
Beck Tunnel. g s.l.	Utah	100,000	1 000,000	0.10	675,000	Oct. 1907	.02
Bingham & N.H.,c.g	Utah	2,000,000	226,000	5	22,600	Sept. 1906	.10
Boston & Montana.	Mont	3,750,000	150,000	25	49.675.000	Apr. 1908	3.00
Bull.Beck.&Cham.g	Utah	1,000,000	100,000	10	2,688,400	Apr. 1907	.10
Bunker Hill & Sull.	Ida	3,000,000	300.000	10	10,221,000	June 1908	.25
Butte Coalition,c.s.	Mont	15,000,000	1,000,000	15	2.450,000	Dec. 1907	.15
Calumet & Arizonac	Ariz	2,500,000	200,000	10	9.500.000	Apr. 1908	1.00
Calumet & Hecla,c.	Mich	2,500,000	100,000	25	106,850,000	June 1908	5.00
Camp Bird, g., s.	Colo	5,500,000	820,000	5	5,229,673	Mar. 1908	.48
Carisa, c.g.	Utah	500,000	500,000	1	55,000	Nov. 1906	.01
Colorado, l. g. s.	Utah	200,000	1,000,000	0.20	670,000	Jan. 1908	.05
Columbus Con. c.	Utah	1,500,000	283,540	5	226,832	Oct. 1907	.20
Combi'tion Co.G'f'd	Nevada	400,000	320,000	1	688,000	Sept. 1906	.15
Con. Mercur, g.	Utah	1,000,000	1,000,000	1	3,385,313	Dec. 1906	.02½
Continental, z. l.	Mo	550,000	22,000	25	220,000	Oct. 1907	.50
Copper Range Con.	Mich	38,500,000	383,781	100	7,245,363	June 1908	1.00
Creede United, g.	Colo	2,000,000	1,625,000	1	214 053	July 1906	.00½
Daly Judge, g. s. l.	Utah	300,000	300,000	1	225,000	Apr. 1907	.37½
Daly West, g. s. l.	Utah	3,600,000	180,000	20	5,877,000	Dec. 1907	.30
De Lamar, g. s.	Ida	400,000	67,180	5	2,926,370	May 1905	.72
Dillon, g.	Colo	1,250,000	1,250,000	1	21,875	July 1905	.01
Doctor Jack Pot.	Colo	3,000,000	3,000,000	1	277,000	June 1906	.00½
Doe Run, l.	Mo	10,000,000	59,062	100	1,523,631	Mar. 1908	.50
Elkton Con., g.	Colo	3,000,000	2,500,000	1	2,079,461	Apr. 1908	.01½
El Paso, g.	Colo	2,500,000	2,450,000	1	1,022,750	June 1906	.01
Fed. Sm., com.	Idaho	10,000,000	60.000	100	2,618,750	May 1908	1.50
Federal Sm., pf.	Idaho	20,000,000	120,000	100	3,701,250	May 1908	1.75
Findley, g.	Colo	1,250,000	1,250,000	1	337,500	Sept. 1906	.01
Florence, g.	Nevada	1,250,000	1,050,000	1	210,000	Apr. 1908	.10
Frances-Mohawk,g	Nevada	1,000,000	910,000	1	410,000	Jan. 1908	.05
Gemini-Keystone	Utah	500,000	5,000	100	1,950 000	July 1907	10.00
Gold King Con.	Colo	5,750,370	5,750,370	1	1,407,504	May 1905	.01
Goldfield Con., g.	Nevada	50,000,000	5,000,000	10	1,000,000	Nov. 1907	.10
Grand Central, g.	Utah	250,000	250,000	1	1,333,000	Oct. 1907	.05
Gwin Mine, Dev., g.	Cal	1,000,000	100,000	10	496,000	Apr. 1906	.05
Hecla, s. l.	Idaho	250,000	1,000,000	0.25	1,560,000	Apr. 1908	.01
Homestake, g.	S. D.	22,000,000	218,400	100	22,859,240	June 1908	.50
HornSilver,g.s.c.z.l	Utah	10,000,000	400,000	25	5,642,000	Sept. 1907	.05
Inter'l Nickel, pf.	N. Y.	12,000,000	89,126	100	1,470,579	Aug. 1908	1.50
Iron Silver.	Colo	10,000,000	500,000	20	4,100,000	Oct. 1907	.10
Jamison, g.	Cal	3,300,000	390,000	10	301,870	Apr. 1908	.02
Jerry Johnson.	Cal	2,500,000	2,500,000	1	86,700	Jan. 1908	.01
Kendall, g.	Mont	2,500,000	500.000	5	1,205,000	Feb. 1908	.02
Liberty Bell, g. s.	Colo	700,000	130,551	5	130,440	Jan. 1907	.15
Lightner, g.	Cal	125,000	102,255	1	253,081	Oct. 1906	.05
Lower Mammoth, g	Utah	190,000	190,000	1	42,750	Aug. 1907	.07½
Mammoth, g. s. l.	Utah	10,000 000	400,000	2.50	2,220,000	Mar. 1908	.05
Mary McKinney, g.	Colo	1,500,000	1,304,252	1	801,765	Apr. 1907	.03
May Day, g. s. l.	Utah	800,000	800,000	1	70,010	Oct. 1907	.01½
Mohawk, c.	Mich	2,500,000	100,000	25	1,650,000	July 1908	2.50
Mont. Ore Purch.	Mont	2,500,000	80,833	25	9.437,274	Jan. 1907	15.00
Nevada Hills, s.g.	Nevada	5,000,000	746,000	5	373,000	Dec. 1907	.10
New Century, z., l.	Mo	300,000	300,000	1	230,300	Aug. 1907	.00½
Newhouse M. & S.c.	Utah	6,000,000	600,000	10	300,000	Sept. 1907	.50
New Idria, q.	Cal	500,000	100,000	5	999,000	Apr. 1908	.30
New Jersey Zinc	U. S.	10,000,000	100,000	100	12,000,000	May 1908	4.00
North Butte.	Mont	6,000,000	400,000	15	5,600,000	June 1908	1.00
North Star, g.	Cal	2,500,000	250,000	10	1,599,489	Mar. 1908	.25
Old Dominion, c.	Ariz	8,750,000	293,245	25	574,088	Aug. 1907	1.00
OldDominion,M&Sc	Ariz	5,000,000	162,000	25	202,500	Aug. 1907	1.25
Old Gold	Colo	2,101,150	2,101,150	1	10,506	Mar. 1906	.05
Ophir, g. s.	Nevada	302,400	100,800	3	1,806,280	May 1908	.10
Osceola, c.	Mich	2,500,000	96,150	25	7,035,650	July 1907	7.00
Parrot, c,s.	Mont	2,300,000	229,850	10	6,807,649	Sept. 1907	.25
Pennsylvania, g.	Cal	5.150,000	51,500	100	284,925	July 1905	.10
Pitts. L. & Z., l.z.	Mo	1,000,000	1,000,000	1	20,000	July 1907	.02
Portland, g.	Colo	3,000,000	3,000,000	1	7,876,080	Apr. 1908	.04
Quartette, g. s.	Nevada	1,000,000	100,000	10	375,000	July 1907	.20
Quincy, c.	Mich	3,750,000	110,000	25	18,230,000	June 1908	1.00
Rocco Homest'k,l.s.	Nevada	300,000	300,000	1	112.000	Dec. 1905	.02
Sacramento, g, q.	Utah	1,000,000	1,000,000	1	258,000	Nov. 1906	.00½
St. Joseph, l.	Mo	20,000,000	1,000,000	10	5,858,357	June 1908	.15
Silver Hill, g. s.	Nevada	108,000	108,000	1	81.000	June 1907	.05
Silver King, g. s. l.†	Utah	3,000,000	150,000	20	11,187,500	July 1907	.33½
Silver King Co't'n.†	Utah	6,250,000	1,224,425	5	367,410	Oct. 1907	.15
Shannon, c.	Ariz	3,000,000	300,000	10	450.000	July 1907	.50
Snowstorm, s. l.	Ida	1,500,000	1,500,000	1	450,000	Sept. 1907	.03
Standard Con., g. s.	Cal	2,000,000	178,394	10	5,158,452	Dec. 1907	.10
Stratton'sIndepend	Colo	5,500,000	1,000,007	5	4 895,865	Apr. 1906	.12½
Swansea, g. s. l.	Utah	500,000	100,000	5	329,500	Mar. 1907	.05
Tamarack, c.	Mich	1,500,000	60,000	25	9,420,000	July 1907	4.00
Tennessee, c.	Tenn	5,000,000	200,000	25	1,806,250	Feb. 1908	1.25
Tomboy, g. s.	Colo	1,750,000	300,000	5	900.000	June 1906	.48
Tonopah of Nev.	Nevada	1,000,000	1,000,000	1	3,500,000	Oct. 1907	.25
Tonopah Belmont.	Nevada	2,000,000	1,500,000	1	600,000	Apr. 1907	.10
Tonopah Ext'nsion	Nevada	1,000,000	928,433	1	283,030	Apr. 1906	.15
Tonopah Midway.	Nevada	1.000.000	1,000,000	1	250,000	Jan. 1907	.05
Uncle Sam, g.s.l.	Utah	500,000	500,000	1	200,000	Dec 1907	.03
United States, com.	Utah	37,500,000	350,933	50	1,271,698	Apr. 1908	.50
United States, pfd.*	Utah	37,500,000	485,845	50	3,606,043	Apr. 1908	.87½
United Cop. com.	Mont	75,000,000	450,000	100	5,962,500	Aug. 1907	1.75
United, c. pf.	Mont	5 000,000	50,000	100	1,500,000	May 1907	3.00
United, z. l., pf.	Mo.-Kan.	500,000	19,556	25	312,782	Jan. 1908	.50
United Verde, c.	Ariz	3,000,000	300,000	10	19,935,322	Mar. 1908	.75
U.S. Red. & Ref. Pf.	Colo	4,000,000	39,458	100	1,360,294	Oct. 1907	1.50
Utah, g.(Fish Sp'gs)	Utah	1,000,000	100,000	10	300,000	Apr. 1908	.03
Utah Con., c.	Utah	1,500,000	300,000	5	7,836,000	Apr. 1908	.50
Victoria, Utah.	Utah	250,000	250,000	1	177,500	Mar. 1907	.04
Vindicator Con., g.	Colo	1,500,000	1,500,000	1	1,830,000	Apr. 1908	.04
Wolverine, c.	Mich	1,500,000	60,000	25	4,800,000	Apr. 1908	5.00
Work, g.	Colo	1,500,000	1,500,000	1	165,000	Apr. 1908	.01
YankeeCon.	Utah	500,000	500,000	1	157,500	Oct. 1907	.03
Yellow Aster, g.	Cal	1,000,000	100,000	10	958,789	Aug. 1907	.20

*Previous to consolidation $1,436.250 were divided. †Amalgamated.

Coal, Iron and Other Industrials—United States.

Name of Company and Location.		Author. ized Capital.	Shares. Issued	Par Val. $	Dividends. Total to Date.	Latest. Date.	Amt.
Ala. Con., C. & I., pf.	Ala.	$2,500,000	24,638	100	$905,265	May 1905	$1.75
Allis-Chalmers, pf.	U. S.	25,000,000	200,000	100	3,213,750	Feb. 1904	1.75
Amer. Ag. Chem., pf.	U. S.	20,000,000	181,530	100	9,002,752	Apr. 1908	3.00½
American Cement	Pa.	2,000,000	200,000	10	1,168,000	Jan. 1908	.80
American Coal.	Md	1,500,000	50,000	25	2,367,500	Sept. 1907	1.25
Associated Oil.	Cal	21,000,000	21,000,000	1	630,000	Aug. 1905	.01
Bethlehem Steel, pf.	Pa.	15,000,000	150,000	100	900,000	Nov. 1906	.75
Cambria Steel.	Pa.	50,000,000	900,000	50	9,337,500	Feb. 1908	.75
Caribou Oil.	Cal	100,000	80,000	1	56,000	July 1905	.07
Central C. & C., com.	Mo	5,125,000	51,250	100	2,229,375	Apr. 1908	1.50
Central C. & C., pf.	Mo	1,875,000	18,750	100	1,359,378	Apr. 1908	1.25
Central Oil	W. Va.	1,500,000	60,000	25	182,500	May 1904	.25
Claremont Oil.	Cal	500,000	450,000	1	58,500	June 1905	.01
Col. & Hock. C & I,pf.	Ohio	7,000,000	69,244	100	383,818	Apr. 1908	1 50
Consolidated Coal	Ill.	5,000,000	50,000	100	350,000	July 1904	1.00
Consolidation Coal.	Md	10,250,000	102,500	100	9,621,650	Jan. 1908	3.50
Crucible Steel, pf.	Pa.	25,000,000	250,000	100	2,125,000	June 1907	1.50
Empire S. & I., pf.	N. J.	2,500,000	25,000	100	895,533	July 1908	3.00
Fairmont Coal.	W. Va.	12,000,000	120,000	100	2,100,000	Jan. 1908	2.00
Four Oil	Cal	500,000	300,000	1	105.406	July 1905	.02
General Chem. Com.	U. S.	12,500,000	74,103	100	2,115,640	June 1908	1.00
General Chem., pf.	U. S.	12,500,000	100,000	100	5,140,178	Apr. 1908	1.50
George's C'k Coal	Md	2,500,000	22,000	100	1,188,000	July 1904	3.00
Imperial Oil	Cal	1,000,000	100,000	100	880,000	July 1905	.20
International Salt.	Penn.	30,000,000	182,280	100	927,060	Dec. 1906	1.00
Jeff. & Cl'f C. & I., cm	Pa.	1,500,000	15,000	100	330,000	Aug. 1905	5.00
Jeff. & Cl'f. C. & I.,pf.	Pa.	1,500,000	15,000	100	938,000	Feb. 1908	2.50
Kern River Oil.	Cal	2,000,000	20,000	100	39,500	May 1905	.13
Lehigh Coal & Nav.	Pa.	17,378,500	346,901	50	27,002,297	May 1908	2.00
Maryland Coal,pf.	Md	2,000,000	18,850	100	1,715,085	June 1908	2.50
Monon R. Coal, pf.	Pa.	10,000,000	100,000	100	3,854,945	Jan. 1908	3.50
National Carbon, pf.	U. S.	4,500,000	45,000	100	2,047,500	May 1905	1.75
National Lead, com.	N. Y.	15,000,000	149,054	100	2,720,237	July 1908	1.25
National Lead, pf.	N. Y.	15,000,000	149,040	100	17,372,608	June 1908	1.75
Nat'l Steel & Wire,pf.	N. Y.	5,000,000	25,778	100	631,561	May 1906	1.75
New Central Coal	Md	1,000,000	50,000	20	350,000	May 1907	.40
New River Coal, pfd.	W. Va.	4,000,000	37,617	100	225,702	Nov. 1907	1.50
Pacific Coast Borax	Cal	2,000,000	19,000	100	2,086,500	Aug. 1905	1.00
Peerless Oil.	Cal	1,000,000	92,000	10	396,320	May 1905	.14
Penna. Salt.	Pa.	3,000,000	60,000	50	14,918,000	Apr. 1908	3.00
Penna. Steel, pfd.	Pa.	25,000,000	168,214	100	8,204,493	Nov. 1907	3.50
Phila. Gas, com	Pa.	28,953,029	579,061	50	8,484,336	Nov. 1907	.75
Phila. Gas, pf.	Pa.	6,000,000	120,000	50	2,700,000	Mar. 1908	1.25
Pittsburg Coal, pf.	Pa.	32,000,000	297,010	100	11,434,962	Apr. 1905	1.75
Pocahontas Coll., pf.†	W. Va.	2,800,000	28,000	100	84.000	Jan. 1908	3.00
Pocahontas Coll.,cm†	W. Va.	4,520,000	45,200	100	135,600	Oct. 1907	3.00
Republic I. & S., pfd.	Ill.	25,000,000	204,169	100	6,045,338	Apr. 1908	1.75
Sloss-Sheffield, com.	Ala.	10,000,000	100,000	100	1,625,000	Mar. 1908	1.25
Sloss-Sheffield, pf.	Ala.	10,000,000	67,000	100	3,634,750	July 1908	1.75
Standard Oil.	U. S.	100,000,000	970,000	100	614,002,905	June 1908	9.00
Tenn. C. & I., com.	Tenn.	22,553,600	225,536	100	3,583,060	Nov. 1907	1.00
Tenn. C. & I., pf.	Tenn.	248,000	2,480	100	390,040	Nov. 1907	2.00
Texas & Pacific Coal.	Texas	2,500,000	23,940	100	1,663,830	Dec. 1908	1.50
United Metals Selling	U. S.	5,000,000	50,000	100	5,125,000	Apr. 1908	5.00
U. S. SteelCorp.,cm.,	U. S.	550,000,000	5,083,025	100	73,666,079	June 1908	.50
U. S. Steel Corp., pf.	U. S.	360,281,100	3,603,141	100	206,371,215	May 1908	1.75
Va. Carolina Ch., pf.	U. S.	20,000,000	180,000	100	13,620,869	July 1908	2.00
Warwick I. & S.	U. S.	1,500,000	145,581	1	473,138	Nov. 1907	.30
Westmoreland Coal.	Pa.	3,000,000	60,000	50	8,730,000	Apr. 1908	2.50

Canada, Mexico, Central and South America.

Name of Company and Location.		Author- ized Capital	Shares. Issued.	Par Val. $	Dividends. Total to Date.	Latest. Date.	Amt.
Amistad y Conc'rdia.	Mex	$480,000	9,600	50	$258,064	Jan. 1905	$1.71
Batopilas.	Mex.	9 000,000	446,268	20	† 55,784	Dec. 1907	.12½
British Columbia, c.	B. C.	3,000,000	503,000	5	201,200	Sept. 1907	.40
Buffalo, s.	Ont.	1,000,000	900,000	100	216,000	July 1908	.08
Butters' Salvador, g.	Salv	750,000	150,000	5	600,000	Apr. 1905	.25
Coniagas (Cobalt).	Ont.	4,000 000	800,000	5	600,000	May 1908	.10
Consolidated M & S.	B. C.	5,500,000	53,552	100	781,885	Nov. 1907	1.25
Crow's Nest Pass.	B. C.	4,000,000	160,000	25	2,018,648	July 1907	.62½
Dolores, g. s.	Mex.	2,000,000	400,000	5	360,000	May 1908	.15‡
Dominion Coal, com.	N. S.	15,000,000	150,000	100	2,850,000	July 1908	1.00
Dominion Coal, pf.	N. S.	3,000,000	30,000	100	‡630,000	Feb. 1908	3.50
Dos Estrellas, g. s.*	Mex	300,000	300,000	1	6,510,000	Apr. 1908	.50
El Oro, g. s.	Mex	5,750,000	1,080,000	5	4,600,800	Jan. 1908	.36
Esperanza, s. g.	Mex	2,275,000	455,000	5	8,426,150	Apr. 1908	1.09
Foster Cobalt, s.	Ont.	1,000,000	1,000,000	1	50,000	Jan. 1907	.05
Granby Con.	B. C.	15,000,000	135,000	100	3,238,630	June 1908	2.00
Greene Con. Copper.	Mex.	8,640,000	864,000	10	6,137,800	Mar. 1907	.40
Greene Con. Gold.	Mex.	5,000,000	500,000	10	300,000	July 1905	.20
GreenGold-Silv'r,pfd	Mex.	3,000,000	300,000	10	120,000	Mar. 1907	.40
Guanajuato.	Mex.	3,000,000	540,000	5	74,250	Oct. 1906	.07
Guggenheim Expl.	Mex.	17,000,000	105,000	100	4,485,000	July 1908	2.50
Hinds Con., g.s.c.l.	Mex.	5,000,000	5,000,000	1	100,000	Feb. 1908	.02
Kerr Lake, s.	Ont.	3,000,000	600,000	5	660,000	July 1908	.15
LeRoi No. 2, g.	B. C.	3,000,000	120,000	25	774,000	Mar. 1908	.48
McKinley-Darragh,s	Ont.	2,500,000	2,000,000	1	180,000	Jan. 1908	.04
Mexican Coal & Coke	Mex.	5,000,000	50,000	100	600,000	Dec. 1905	3.00
Mex. Con. M. & S. Co.	Mex.	2,500,000	240,000	10	660,000	Mar. 1908	.25
Mines Co. of Am.	Mex.	2,000,000	2,000,000	1	3,145,000	June 1908	.02
N. Y. & Hond. Ros.	C. A.	1,500,000	150,000	10	2,227,000	June 1908	.10
Nipissing, s.	Ont.	6,000,000	1,200,000	5	1,680,000	Apr. 1908	.15
North Star.	B. C.	1,500,000	1,300,000	1	351,000	Dec. 1904	1.00
N. S. St. & Coal, com.	N. S.	5,000,000	49,876	100	1,087,856	Apr. 1908	1.50
N. S. St. & Coal, pf.	N. S.	1,030,000	10,300	100	437,750	Apr. 1908	2.00
Penoles*	Mex.	250,000	2,500	100	8,630,000	Dec. 1907	20.00
Platanillo.	Mex.	500,000	206,989	1	5,580	Sept. 1906	.00
Reco, g. s. l.	B. C.	1,000,000	958,000	1	327,082	Apr. 1906	.02
Silver Queen, s.	Ont.	1,500,000	1,500,000	1	195,000	May 1908	.05
Tezuitlan Copper	Mex	1,000,000	10,000	100	.....	July 1908	1.50
Tilt Cove, c.	N. F.	1,000,000	89,000	2	21,360	Jan. 1905	.48
Trethewey, s.	Ont.	1,000,000	1,000,000	1	80,000	Mar. 1907	.04
Tyee, c.	B. C.	940,000	180,000	5	136,800	Dec. 1904	.24

*Mexican Currency. †Since reorganization. ‡Since August, 1905.

The Williams Debris Crusher

Among the successful machines used throughout the anthracite coalfields for the reduction of débris or refuse, may be mentioned the Williams crusher. This machine was invented in 1895, and consists of a revolving shaft upon which are mounted disk plates; between these disk plates are hammers, which are pivoted at four, and sometimes six points around the disks; there are from four to six rows of hammers suspended from pivots or bolts. Each row contains from ten to twenty hammers, depending on the width of the machine. This entire cylinder revolves at a speed of from 700 to 1000 r.p.m., depending on the diameter of the machine. The cylinder is mounted in a substantial housing or frame, with dynamo or ring oiling bearings.

The material enters the hopper of the machine and comes in contact with the hammers at about a 45-deg. angle; the débris is then broken against this breaker plate, afterward passing through a concentric cage which follows the periphery of the hammers, from a point just below the breaker plate around to the back of the machine, the top of the case being about 1¼ in. from the ends of the hammers.

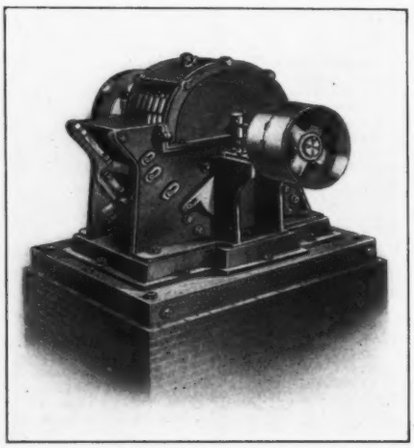
These hammers swing clear of the cage and breaker plate, the material being crushed between the ends of the hammers, the breaker plate and the cage. The cage is constructed on the grate-bar type, being three or four bars to a section; the sections are carried on either end in a recess in the machine. The construction of the cage is tapered tool-steel bars, each bar being about 4 in. deep, about 1 in. at the top, and ½ in. at the bottom, so as to give a quick and free discharge.

The opening between the bars, which regulates the size of the material, is usually set at ½ in., although in some cases they are set at ⅜ in., and in extreme cases ¼ in. When set at ½ in. the machine discharges a product, 95 per cent. of which would be ⅜ in. or finer. This size has been found satisfactory for all practical purposes in connection with the crushing of the débris for the anthracite mines.

The hammers, the cage, and the breaker plate are adjustable so as to take up the wear and tear on the grinding parts; the hammers are so arranged that they may be let out ½ in. at a time, which adjustment is made by a series of three or four adjusting holes to each set of hammers. When the machine is new, the hammers are all in hole No. 1; when the hammers become somewhat worn, all four rows are set out at the same time into hole No. 2, which is ½ in. farther away from the center of the shaft than is hole No. 1, and in this way, the original grinding diameter of the machine is maintained the same at all times.

The breaker plate, which is in the hopper of the machine, is adjustable toward the hammers by means of a large adjusting screw at the front of the machine; the cage is adjusted upward toward the hammers by inserting adjusting rings in the recess in the side of the machine; these rings are ¼ in. thick. After the adjustment has been made and a sufficient amount is worn from the hammers, rings ½ in. thick are put under the cages to bring them closer to the hammers; in this way the machine is thoroughly adjustable, and gives a maximum capacity with a given horse-power, and with small cost for maintenance. The machines are manufactured with capacities ranging from 10 to 300 tons per hour, and crush to any fineness, from run-of-mine size down to 1 in., ¾ in., ½ in., ⅜ in., ¼ in., and finer.

The Williams machine is used in over 500 bituminous operations for preparing



THE WILLIAMS DEBRIS CRUSHER

coal for the coke ovens, and has been the means of raising the grade of coke in a number of these bituminous plants. In the anthracite field the Lehigh Valley Coal Company has 10 of these crushers in its various operations, while the Lehigh & Wilkes-Barre Coal Company uses five machines. Catalogs describing the various features of the machine, have been prepared by the Chicago office of the Williams Crusher Company in the Old Colony building.

Industrial

Archer Iron Works has removed from 36 La Salle street to their permanent quarters, room 739, First National Bank building, Chicago, Illinois.

Francis and Company has opened its new offices in the First National Bank building, 50 State street, Hartford, Conn., and are importing and breaking carbons for diamond drill work, and also manufacture all kinds of diamond pointed tools for mechanical purposes.

The Gladstone furnace of the Pioneer Iron Company, one of the important charcoal stacks in the Lake district, will soon be blown out for repairs and relining. It has been in constant operation for more than six years, and needs some changes. This is one of the Cleveland-Cliffs Iron Company's subsidiary enterprises, and is equipped with chemical works for the distillation of the wood products.

The Trenton Iron Company has been awarded a contract by The Board of Public Works, Los Angeles, California, for an 8000-ft. wire-rope tramway to be used in conveying clay for the cement plant at Lepachi aqueduct. The same company also has closed a contract with the Eureka Slate Company, of Slatington, California, for an extension of their present wire-rope tramway 10,100 ft. to the Sacramento and Placerville Railroad.

H. W. Caldwell and Son Company, of Chicago, Ill., engineers, founders, machinists and manufacturers of elevating, conveying and power-transmitting appliances, announces that it has opened a New England engineering and sales office, room 337, Oliver building, 141 Milk street, Boston, Mass., in charge of Malcolm R. White, mechanical engineer, who will give attention to engineering propositions, inquiries and orders from the New England States.

The chlorine plant of the United States Reduction and Refining Company, at Colorado Springs, Colo., has installed in its power house a 150-k.w. Allis-Chalmers synchronous motor generator set to supply current for the electrolytic production of chlorine gas, used in the chlorination treatment of gold ores. It is used in conjunction with the MacDonald cell in which carbon electrodes form the anode and a cast-iron tank the cathode, with an electrolyte of sodium chloride solution. The machine has current capacity for the manufacture of 2000 lb. of chlorine solution per twenty-four hours.

H. W. Caldwell and Son Company has recently completed a rope sheave of unusual dimensions. The sheave is 20ft. in diameter, has 20 grooves for 2-in. rope and weighs finished 48,000 lb. The sheave has a double set of arms and was cast in one piece and then split for convenience in handling and erecting. The sheave was cast in the foundry of the Caldwell Company and finished on 20-ft. boring mill. It is intended for use in connection with the main drive in a refrigerating plant located in Mexico, the large sheave receiving power from an electric motor, the transmission being by means of what is generally known as the American or single-rope system.

The Schutte and Koerting Company, manufacturers of steam and engineering specialties for power plant, chemical and other industries, has opened a branch sales office in the Keenan building, Pittsburg, Penn., where they are represented by E. A. Knowlton. Their new catalogs are being distributed in three sections; one section pertaining to apparatus for the chemical industry, one to apparatus for use in power plants, etc., and a general catalog illustrative and descriptive of their entire line is probably one of the most up-to-date and complete catalogs published by any engineering firm. These will be sent on request to those interested.

Trade Catalogs

Lane Slow Speed Chilian Mill Company, Los Angeles, Cal. . Catalog. Chilian Mills. Pp. 30, illustrated, paper, 6x9 in.

Wonham-Magor Car Works, Passaic, N. J. Bulletin No. 11. Standard V-Body Double-Side Dump Cars. Pp. 4, illustrated, paper, 6x9 in.

Columbus Steam Pump Works, Columbus, Ohio. Catalog. Steam Pumps and Pumping Machinery. Pp. 24, illustrated, paper, 5x7½ in.

American Railway Supply Company, 24 Park Place, New York. Catalog. Factory Time Checks, etc. Pp. 38, illustrated, paper, 7½x9 in.